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Additions to the Known Herpetological Fauna of Costa Rica with Comments on Other Species. No. II

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ABSTRACT: This paper treats of six caecilians, seven Salientia, ten lizards, and five snakes from Costa Rica. Of this number the following are described as new: *Dermophis costaricensis*, *Dermophis occidentalis*, *Dermophis glandulosus*, *Eleutherodactylus mimus*, *Eleutherodactylus vocator*, *Agalychnis saltator*, *Anadia metallica arborea*, *Anadia metallica attenuata*, *Leposoma southi orientalis*, *Lepidophyma reticulatum*, *Lepidophyma anomalum*, *Lepidophyma ophthalmum*.

Atelopus varius loomisi is elevated to species rank and the following are added to the list of Costa Rican species: *Dermophis parviceps*, *Eumeces managuae*, *Leptotyphlops ater*.

A fourth journey to Costa Rica was made by me in the summer of 1954. Much of my effort in collecting was made along the Panamanian border of Costa Rica and along the Nicaraguan border in the north. Political difficulties between the two latter countries prevented me from carrying out plans for more extensive collecting in the Caribbean drainage area of the northern border.

Accompanied by Prof. Marco Tulio Pacheco I visited the town of Tilarán and collected chiefly in an area to the northeast at Finca Bosco and Lake Arenal. One trip was taken along the Pan-American Highway to the northern border. One journey was made to Cocos Island, another to the upper reaches of the Saripiquí river.

For the most part my efforts yielded gratifying results. However, an unknown Teiid lizard, seen at an elevation of about 2,425 meters on the west slopes of Cerro de la Muerte, escaped from under my hand, leaving only a wiggling tail as evidence that such a creature occurs. Numerous toad voices of a species not identified, but believed to be a species of *Microhyla*, were heard

at Liberia in late August, but none could be found in the lush vegetation growing in the pools from whence the calls issued.

Despite the collections I have made on four journeys much work must be done before the entire herpetological fauna is collected; and before the details of the distribution of the various species within the country can be authoritatively known.

I wish to acknowledge my grateful thanks to Professor Marco Tulio Pacheco for very numerous specimens and for the assistance rendered by him and members of his family; and to Dr. and Mrs. Leslie Holdridge who were my hosts for a part of the summer.

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CAECILIIDAE

Two genera of this order, *Dermophis* and *Gymnophis*, are recognized in Costa Rica. These genera may be separated by the following key:

Eye present, not covered by bone, usually visible through the skin. One mandibular tooth-series (inner lacking).....*Dermophis*
 No visible eye, the eye wholly or partially covered by bone in the fully grown specimen; two mandibular tooth-series, the inner consisting of one or more teeth (splenial) on each side.....*Gymnophis*

GENUS DERMOPHIS Peters

Dermophis Peters, Monatsb. Akad. Wiss. Berlin, 1879, p. 937 (no type mentioned); Boulenger, Catalogue of the Batrachia Gradientia s. Caudata and Batrachia Apoda in the collection of the British Museum, 1882, p. 97 (repeats in English Peters' definition. Includes six species (one of which is African), some of which have the inner mandibular series, others do not); Noble, Bull. Amer. Mus. Nat. Hist., vol. 49, no. 11, 1924, p. 305.
Gymnophis Dunn (part.) Bull. Mus. Comp. Zool. Harvard Coll., vol. 91, no. 6, 1942, p. 461 (combines *Dermophis*, *Gymnophis* and *Cryptosiphis*).

The original definition of *Dermophis* Peters reads as follows: "Augen sichtbar. Tentakelgrube kreisförmig vor und unter dem Auge, Tentakel kugelförmig; Körper mit dachziegelförmigen Schlupfen. Unterkieferzähne in zwei Reihen." "America und Afrika." Peters listed under the genus, *Dermophis mexicanus*, *proximus*, *sinus*, *brasiliensis*, *brevirostris*, and *thomensis*. No type was designated but Dr. G. K. Noble, in 1924, named *mexicanus* the type, perhaps without being aware that *mexicanus* did not agree fully with the generic description. Dunn, 1942, likewise seemingly was unaware of this.

Peters stated that the genus had two mandibular tooth-rows but included *mexicanus* that has only a single row. Since the latter has become the type of the genus by designation, it is necessary to correct the generic definition or by a suspension of rules designate a type that has two rows—for example, *proximus*. Certainly less confusion exists by redefining the genus as having no inner mandibular tooth-series, thus excluding those species having an inner mandibular tooth-series. Were it possible to designate a new type of the genus and *proxima* were designated, then *Dermophis* and *Gymnophis* would become synonyms since *multiplicata* and *proxima* are congeneric, and a new generic designation would be necessary for the group of species having an eye (usually visible) not covered by bone and the single mandibular tooth-series. Other workers have not solved the problem of throwing the two genera together. If they have found forms that differ in the structures of the skulls

with relation to the eye, they have probably overlooked or disregarded the possibility that still another genus was involved.

It may be that *Gymnopsis multiplicata oaxacae* with a visible eye, should be regarded a *Dermophis*. Dunn is somewhat ambiguous regarding the presence of the inner mandibular row of teeth. In his general discussion he says of the genus *Gymnopsis* (combined *Dermophis* and *Gymnopsis*) "the inner mandibular tooth row is poorly developed or absent (p. 441)". "In *Gymnopsis* and in *Siphonops* the teeth on the lower jaw are *uniform* but larger than those on the upper. The inner mandibular row is reduced to one tooth on a side (in *oligozona* and in *multiplicata*) or is entirely absent." In the discussion of individual species he states: "Forms with visible eyes have on the whole, no teeth in the inner mandibular row." Under *Gymnopsis multiplicata oaxacae* Dunn gives "inner mandibular teeth" as a character. One of the specimens listed by Dunn (EHT 16869) has no trace of the inner mandibular teeth. Mertens does not mention the character. Should it prove that others of the series referred to *oaxacae* have a visible eye not roofed by bone (as in EHT 16869) and lack the second series of mandibular teeth they should be referred to the genus *Dermophis* as a distinct species.

Dermophis parviceps Dunn

Siphonops parviceps Dunn, Occ. Papers. Boston Soc. Nat. Hist., vol. 5, July 9, 1924, pp. 93-94 (type locality, La Loma, Bocas del Toro Province, Panamá, elevation 1,200 ft. [not 2,000 ft. as originally stated]); Dunn, Proc. New England Zool. Club., vol. 10, Oct. 11, 1928, pp. 74-75.
Gymnopsis parviceps Dunn, Bull. Mus. Comp. Zool. Harvard Col., vol. 91, no. 6, Dec. 1942, pp. 462, 478-479.

Diagnosis: Eye visible; lacking the inner mandibular teeth; primaries reduced, 96-97; secondaries 13-15; 5-10 complete; tentacle close to lip and nearer eye than nostril; ratio of diameter of body to total length, 21-24; probably under 200 mm. in length.

Description: (From KUMNH No. 36276, Moravia de Chirripó, Limón Province, Costa Rica). Head oval, slender, the width of head (5 mm.) at mouth angle, distinctly less than width of neck (7 mm.) or body (8 mm.); head length to first transverse nuchal groove (dorsally) 7.3 mm.; head to angle of mouth 4.5 mm.; width of body in total length (191 mm.), 21.3 times; tentacle close to lip, its distance from eye (1.25 mm.) less than its distance from nostril (2 mm.); distance between eye and nostril 3 mm.; snout extending beyond mouth 1 mm.; distance between eyes, 3.8 mm.; first nuchal groove passes across head then runs down and somewhat forward,

crossing the chin 6.2 mm. back from tip of snout; second groove crosses throat 3.3 mm. back of first; third groove separated on throat from second by 4 mm.; each of the annular folds, formed by the three grooves, with secondary grooves on dorsal surface only; on each side of the neck, beginning on back part of head, a longitudinal lateral fold limited above by a slight longitudinal groove, and extending back to near end of body, the ventral coloration covering the anterior part of fold. Palatal region rather short; maxillary-premaxillary tooth-series total 30; vomero-palatine series 28; mandibular teeth total 24; no inner mandibular (or splenial) teeth; outer mandibular teeth larger than maxillary or other teeth above; primary grooves 97; secondaries 14, with five of the latter complete; vent with a primary groove entering its sides, its anterior edge with two large lobules; a pair of narrow lateral lobules and five lobules bordering posterior part of vent.

Color in life: Above deep plumbeous lavender with some scattered irregular whitish spots or flecks, becoming lighter at the beginning of the lateral ridge; lighter grayish-lavender low on sides and venter; head pinkish flesh. In preservative head has become brownish gray, a slightly darker tone than the venter; ventral coloration limited by this lateral fold or ridge except for the first three annuli on the fold.

Measurements in mm.: Total length, 192 (180); snout to vent, 191; head width, 5 (5); width of neck, 7; width of body, 8 (8); head to first annular groove, dorsally, 7.3; head to angle of mouth, 4.5; width of body in total length, 21 times; tentacle from eye, 1.25; tentacle to nostril, 2; between eye and nostril, 3; length of snout beyond mouth, 1.1. (Measurements in parenthesis those given for the type.)

Dermophis occidentalis * sp. nov.

(Fig. 1.)

Type: KUMNH No. 36298, collected on the Dominical Road approximately 15 km. WSW of San Isidro del General in open meadow under stones, Aug. 3, 1954; Edward H. Taylor, coll.

Paratypes: KUMNH No. 36296, 36297, topotypes, taken July 19, 1952, same collector.

Diagnosis: A presumed diminutive species with secondaries 29-37; the primaries 112-113; secondaries completely surrounding body 10-12; length 186-204; body width in length 30-33.

* Latin, *occidentalis* = western.



FIG. 1. *Dermophis occidentalis* sp. nov. Type. KUMNH No. 36298, 15 km. WSW San Isidro del General, San José Province, Costa Rica. Total length, 186 mm.

Description of the type: Body slender, its width (5.9 mm.) contained in body length (186 mm.) 31.5 times; head narrow, oval, its width at mouth angle, 5 mm.; tentacle separated from mouth by .5 mm.; eye from mouth .92 mm.; nostril to eye 2 mm.; eye to tentacle .75 mm.; nostril from tentacle 1.5 mm.; snout projecting beyond mouth 1.1 mm. Snout to first annular groove 5.6 mm.; snout to third annular groove 10.5 mm., dorsal measurement (ventral measurement 10 mm.); primary annular grooves, 112 to vent, followed behind vent by an annular fold partly divided; secondary annuli, 28; secondary annuli completely surrounding body, 9; maxillary-premaxillary teeth (total) 26; vomero-palatine teeth 22 (total); outer mandibular series (total) 21; inner mandibular series absent. The vent is transverse, bordered anteriorly and posteriorly by several fleshy denticulations.

Scales are first found on the posterior part of the body along the primary groove following the beginning of the secondaries. At first the scales are small, forming short transverse rows wider than long (.4 x .9 mm.); they form a strongly overlapping series, usually only one row discernible at first; farther back the scales are much larger, arranged in at least three overlapping transverse rows in each annulus (posterior to the secondary groove and posterior to the primary groove a series of three or four similar transverse rows). These follow the grooves completely around the body. Seen in lateral view when one cuts through the skin, the scales of the back part of the preceding series overlap those of the following series, although they are separated by a series of recumbent glands which open near the groove.

Scales on the posterior part of the body are varied in size, but usually are considerably larger than those occurring anteriorly, some measuring 1.5 mm. x 1.3 mm. Some are cycloid or subcycloid but many of these are more or less truncate anteriorly.

Color in life: Head, on top and sides, light grayish tan; body plumbeous lavender; entire underside a lighter shade growing still lighter under neck; chin and throat lighter than top of head; area about vent dull cream.

Measurements in mm. and data on type and paratypes: Nos. 36298, 36296, 36297, respectively; total length, 186, 194, 204; width of body, 5.9, 6, 6.8; snout to first annular groove (dorsal), 5.6, 5.8, 5.7; snout to third annular groove (dorsal), 10.5, 10.6, 10.4; primary annular grooves, 112, 112, 112; secondary annular grooves, 28, 37, 33; complete secondary grooves, 9, 10, 12; maxillary-premaxillary

teeth (total), 26, 26, 26; vomero-palatine teeth (total), 22, 26, 26; outer mandibular teeth (total), 21, 21, 21; inner mandibular, 0, 0, 0.

Variation: The two paratypes agree well with the type. The eye is dim in No. 36296, but can be discerned at least on one side. The specimens were taken from under rocks or logs in a meadow. Two other species of caecilians occur in this same general area.

Dunn summarily states that "there are never more than two rows of scales or rings to a segment (in *Rhinatrema*, *Gymnopsis* and *Caecilia*) and that there is no overlapping of the scales of one ring by those of another."

Nieden has mentioned that several rows may occur in an annulus and that overlapping may occur, both of which statements are true, at least in certain forms.

Dermophis costaricense * sp. nov.

(Fig. 2)

Type: KUMNH No. 36343. Collected, Cinchona, Heredia Province, Costa Rica, July 14, 1954, by Edward H. Taylor.

Paratypes: KUMNH Nos. 36337-36340, 36342, 36344-36347, all topotypes; July and August, 1954; Edward H. Taylor, coll; Nos. 36447-36448, Moravia de Chirripó, Limón Prov. Costa Rica.

Diagnosis: A *Dermophis* related to, but differing from *mexicanus* in having a higher average number of primaries 112-119 instead of 97 to 100; secondaries 80 to 93 instead of 51-80; total primaries and secondaries, 192-203 instead of 152-186.

Description of the type: Body not especially slender, its width (11 mm.) in total length (330 mm.) 30 times; head oval, its length from first annular groove 12 mm.; to third annular groove 22 mm. (dorsal measurement); when measured on ventral surface the measurements are 10 mm. and 20 mm. respectively; eye visible, not covered by bone, forming a slightly elevated mound, its distance from tip of snout 5.4 mm.; distance between eye and nostril 4 mm.; distance between edge of eye and tentacle 1.9 mm.; between tentacle and nostril 2.8 mm.; tentacle surrounded by a horseshoe-shaped groove, fastened behind to surface skin; angle of mouth to snout tip, 20.5 mm.; primary annular grooves (counting the three grooves of the first two modified annular folds) 113; secondaries (beginning on the 31st annular fold) 83; two partial annuli posterior to vent; first two modified folds each with a transverse groove which is to be interpreted as incomplete secondary folds, but which are not counted.

* Of Costa Rica.

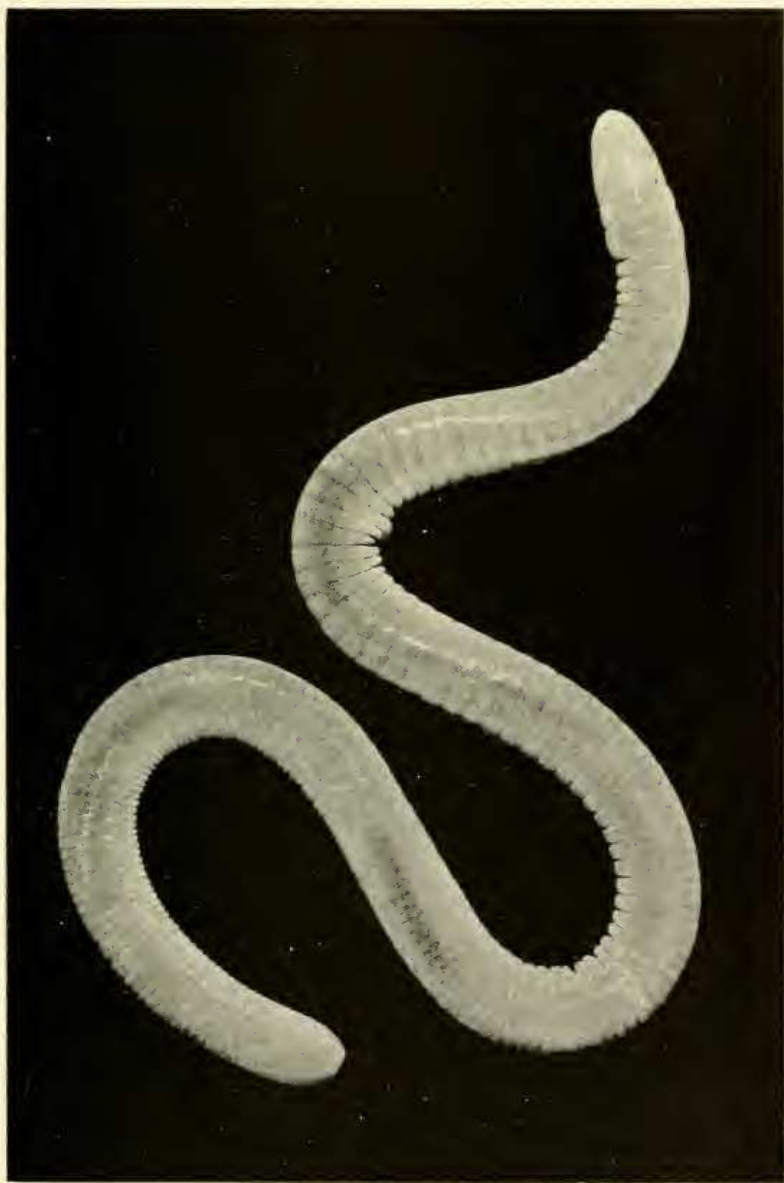


FIG. 2. *Dermophilis costaricense* sp. nov. Type, KUMNH No. 36343, Cinchona, Heredia Province, Costa Rica. Actual total length 330 mm.

Scales begin as far forward as the 18th primary in the dorsolateral part of the annulus, and continue to the end of body, the transverse series growing longer posteriorly; in each annular fold there are four, sometimes five, rows of scales of varying size, contiguous or overlapping laterally, but each strongly overlapping the more posterior series. The scales usually present curved or rounding posterior edges, while the anterior edge is usually truncate.

The ventral surface of the body is more or less flattened, the posterior ventral region especially so; the vent shows two larger fleshy "denticulations" with a smaller median one; anterior to vent, laterally and posteriorly, there are 6 "denticulations," the surfaces of the "denticulations" showing a few indistinct papillae.

Maxillary-premaxillary teeth total 38, the maxillaries much larger than the premaxillaries; vomero-palatine series 38, much smaller than the premaxillaries; outer mandibular series 28, the teeth unequal in size, the largest double the size of the largest maxillaries; no inner mandibular tooth series.

Color in life: Above dark plumbeous, the head showing some lighter variegations; tentacular area and area about nostril lighter; ventral region somewhat lighter than dorsum; region of vent, cream; an indefinite lighter region under neck.

Measurements in mm.: Total length, 330; width of body, 11; width of head at mouth angle, 8.9; width of head at first annular fold, 9.1.

Variation: A series of paratypes from within a few hundred yards of the exact type locality shows some variation in the proportion of body width to body length, as well as certain variation in the number of primaries, secondaries and the number of complete secondaries.

The table on page 509 indicates much of this variation.

Remarks: This is not regarded as a subspecies of *mexicanus* since *Dermophis mexicanus* occurs from north central Veracruz to Panamá (*fide* Dunn) and *gracilior* a subspecies likewise in Panamá presumably shows closer relationship to *mexicanus* than does this species. Since *mexicanus* also occurs on the Caribbean drainage north of the Cordillera Central and on the eastern slopes of the Talamanca Mountains, it is probable that the two ranges overlap considerably. A specimen of *M. mexicanus* has been taken on the northeastern slope of Volcán Poás, within the probable range of this species.

Measurements and data on *Dermophis costaricensis* sp. nov.

Number	Primaries	Secondaries	Complete secondaries	Maxillary, premaxillary teeth	Vomeropalatine	Mandibular	Inner mandibular	Length	Width	Width in length
36447	111	90	13				0	387	15	26 +
36343	113	83	12	38	38	28	0	330	11	30
36340	114	79	11	42	46	30	0	306	10.5	29 +
36337	115	87	10	41	42	28	0	290	10.8	27 —
36448	111	89	10	35	42	26	0	305	10.6	28 +
36344	117	75	9	38	40	28	0	305	10.5	29 +
36342	114	86	12	31	39	28	0	282	9	31 —
36347	117	95	14	38	40	28	0	275	8	34 +
36341	113	59	8	33	36	24	0	265	8.2	32
36338	113	93	11	35	37	24	0	260	8.8	30 —
36346	115	88	9	32	38	26	0	212	9.8	27 +
36345	113	81	9	32	37	26	0	195	7.6	26 —
36339	113	83	8	30	32	24	0	170	6.7	27 —

Nos. 36337-36347 Cinchona.

Nos. 36447-36448 Moravia de Chirripó.

Dermophis costaricensis ranges in altitude from about 1,900 feet at Moravia to approximately 5,000 feet at Cinchona.

Dermophis glandulosus * sp. nov.

Dermophis mexicanus gracilior Taylor, Univ. Kansas Sci. Bull., vol. 34, pt. 2, Feb. 15, 1952, pp. 781-784, pl. 88.

Type: KUMNH No. 29979, San Isidro del General, San José Province, Virgil Cave collector.

Diagnosis: Eyes distinct, the tentacle closer to eye than nostril; 93 primaries (not counting nuchal grooves); 49 secondaries; no inner mandibular tooth-series; grooves throughout most of body showing a series of enlarged glands. Dorsum purplish lavender, somewhat darker on outer edges; lateral fold lighter lavender; ventral surfaces dull cream dimly clouded with lavender; 30 teeth in the maxillary-premaxillary series, the premaxillary teeth larger than others; prevomerine-palatine series total 40, the teeth small; outer mandibular row, 26, the teeth unequal in size. 22 of the 46 body secondaries encircle the body. Total length of type 159 mm.

This specimen was referred by Taylor to *Dermophis mexicanus gracilior* with some hesitation in the above cited work. Further study of this genus suggests that it is not *mexicanus* and is here given a different specific designation. Since the type was described at length in the above publication, it is not repeated here. The accompanying photograph shows something of the curious color pattern and the size and character of the enlarged annular series of glands.

* Latin, *glandulosus* = glandulose.



FIG. 3. *Dermophis glandulosus* sp. nov. Type, KUMNH No. 29979, San Isidro del General, San José Province, Costa Rica. Actual length, 159 mm.

GENUS GYMNOPIS Peters

Gymnopsis Peters, Monatsb. Akad. Wiss. Berlin, 1874, p. 616 (type of genus *Gymnopsis multiplicata* Peters).

The genus *Gymnopsis* was proposed by Peters in 1874, with a very brief description and a single species *multiplicata* (which becomes the type) was described. The genus was described in 1879 as follows: "Augen unter den Schädelknochen gelegen Tentakelgrube etwas höher, sonst wie bei *Siphonops*, weit hinter dem Nasenloch gelegen, ringförmig das kugelförmige Tentaculum einschliessend. Körperhaut mit dachziegelförmig gelagerten Schup-

pen. Unterkieferzähne in zwei Reihen. Im Schädelbau *Siphonops* näher stehen."

Gymnopsis multiplicata multiplicata Peters

Gymnopsis multiplicata Peters, Monatsb. Akad. Wiss. Berlin, 1874, p. 616, pl. 1, fig. 1 (type locality, Veragua, Panamá).

The following specimens are in the collection, previously unreported: KUMNH No. 36667, 5 km. NE Tilarán, Guanacaste Province; No. 36668, San Isidro del General; No. 36670, 15 km. WSW San Isidro del General, Puntarenas Province?; Nos. 36669, 36671, 5 km. E (on highway) of San Isidro del General, San José Province.

In all the specimens the eyes are concealed under the bony surface of the skull, and the inner mandibular tooth row is present. Specimens from higher elevations have, on the average, fewer primaries (7-10) and a concomitant reduction in secondaries. Older, larger specimens (usually) have more teeth than young, smaller specimens, thus approaching the counts for *multiplicata proxima*—in fact, there seems to be an overlap in the count in certain specimens. The range of primaries in these specimens is 121-132, of secondaries 98-114, while in the specimens of *proxima* the range is 112-121, 87-102 respectively (see accompanying table of data and measurements).

Gymnopsis multiplicata proxima (Cope)

Siphonops proximus Cope, Proc. Amer. Philos. Soc., vol. 17, 1877, p. 90 (type locality, eastern Costa Rica.) [=Limón, *vide* Dunn.]

The following specimens are in the collection: KUMNH No. 36675 Cariblanco, Limón Province; Nos. 36672, 36673, 36674, 36676, 36678 Turrialba, Cartago Province; No. 36677 Los Diamantes, Limón Province. The accompanying table shows much of the variation occurring in this series.

The scales in both subspecies usually appear six to eight folds in advance of the beginning of the secondaries. There are several transverse rows (three or four) of scales in each segment. These are contiguous transversely (or somewhat overlapping) and each row imbricates broadly with the following rows. The scales of one segment somewhat overlap those of the following segment in the posterior part of the body, but are separated by a row of elongated recumbent glands.

At birth, the maxillary-premaxillary tooth-series has appeared and 14 teeth are in evidence on each side. The vomerine and palatine teeth are differentiated. There are five or six palatine teeth protruding through the gums. Except for a large, median,

hooked tooth in the mid-line of the palate the vomerine teeth have not appeared above the gums. Subsequently this tooth is probably shed since a differentiated median tooth is not evident in older specimens. In the lower jaw the dentaries have four longer or shorter rows of teeth, irregularly disposed, perhaps 20-25 on each side; an inner mandibular series is not developed at this time. The dentary teeth of these juveniles do not resemble those of the adults. They are somewhat spatulate, each bearing several, fine, clawlike denticulations. A few of them have not yet risen above the surface of the gums but most of them are well above the surface. The two specimens showing this condition are RCT Nos. 331-332. One, 331, was taken in a small pile of rocks with a large adult specimen of *Gymnopsis multiplicata proxima*; the other, No. 332, was in the uterus of the same adult specimen. These measure 129 and 125 millimeters respectively. The arrangement of the mandibular teeth is reminiscent of the condition obtaining in certain adult *Ambystoma*—*Ambystoma schmidt*i and young *Ambystoma texanum*.

I find it difficult to account for the development of these special embryonic teeth. Two explanations are suggested: one that they represent a recapitulation of an ancestral condition, the other that they subserve some intra-uterine function.

The median hooked tooth on the vomer is not present in the intra-uterine specimen.

Gymnopsis multiplicata multiplicata Peters

Number	Locality	Primary grooves	Secondary grooves	Complete secondary grooves	Teeth, maxillary-premaxillary	Teeth, vomero-palatine	Teeth, outer mandibular	Teeth, inner mandibular	Length	Width	Ratio L—W
36667	Tilarán.....	122	101	13	43	47	36	2	384	16	24
36668	San Isidro.....	132	114	16	40	42	36	2	348	13	26.7
36669	5 km. E										
	San Isidro.....	121	98	8	38	44	33	2	323	9.8	32
36670	15 km. wsw										
	San Isidro.....	129	110	14	39	40	27	2	244	5.8	42
36671	5 km. E										
	San Isidro.....	122	102	10	30	30	24	2	148	4.8	31

Gymnopsis multiplicata proxima (Cope)

36672	Turrialba...	118	96	12	40	48	36	2	394	16.8	23.5
36673	Turrialba...	118	95	9	50	54	38	2	391	17	23
36674	Turrialba...	112	87	9	42	48	34	2	360	18	20
36675	Cariblanco...	116	90	13	45	52	36	(?)	344	(19?)	29
36676	Turrialba...	119	93	10	39	38	30	2	279	13	21
36677	Los										
	Diamantes...	121	102	11	34	34	26	2	216	7	31
36678	Turrialba...	116	97	10	33	32	22	2	179	7.8	22

SALIENTIA

Atelopus varius varius (Lichtenstein and von Martens)

(Fig. 4)

Phrynidium varium Lichtenstein and von Martens, Nomenclator Reptilium et amphibiorum Musei Zoologici Berolinensis, 1856, pp. 40, 41 (type locality, Veragoa = Veragua, Panamá).

This brilliantly colored *Atelopus*, black with markings of red and yellow above, was taken at several localities as follows (the first three localities are in the Caribbean, the last four in Pacific drainage areas): No. 32894, Moravia de Chirripó, Limón Province; No. 30299, a problematical specimen from Ujarrás or Navarro (M. T. Pacheco, coll.), No. 32885 Guabata, Mt. Paloma. Nos. 32863-32879, 15 to 20 kms. WSW of San Isidro del General; No. 32894, 4.5 km. E San Isidro del General, along highway; Nos. 32880-32883 near Sarchí, San José Province; Nos. 32886-32888 Palmar, Puntarenas Province. Two specimens, one, No. 32880, a large female from near Sarchí, and a male, No. 32866 from WSW of San Isidro del General are figured. All of the specimens from the Pacific drainage area, except one, agree in the general structural and color characteristics. Most of them are males and smaller than the females.

The dorsal colors are red or red-orange (rarely pinkish), with one or more mesial marks of bright yellow (rarely absent), and other reddish marks present on the limbs; the tips of the digits are yellow, the venter and chin light yellow-flesh, and an area on soles and palms somewhat orange-yellow. A few specimens have one or more small black ventral spots. Both lips are immaculate yellow and the area below the vent is colored like the venter.

The specimen from 4.5 kilometers east of San Isidro del General differs in having the dorsal markings very narrow, more numerous, and the venter has numerous, heavy, rounded or vermiculate marks on a yellow or pinkish-yellow venter. Both lips are blackish. The webbing on the feet is a little more extensive.

The specimens from the Caribbean drainage area do not agree among themselves and two may represent subspecific variants.

No. 32885 agrees in considerable detail with the Pacific group save that the lips are black and there are six rounded black spots on the venter.

No. 32894 has the venter unspotted save for three small spots on the breast and one on the chin. The lower lip is bordered with black and the upper has some dim black marks. The general color pattern shows the dorsal reddish marks narrowed and the middle

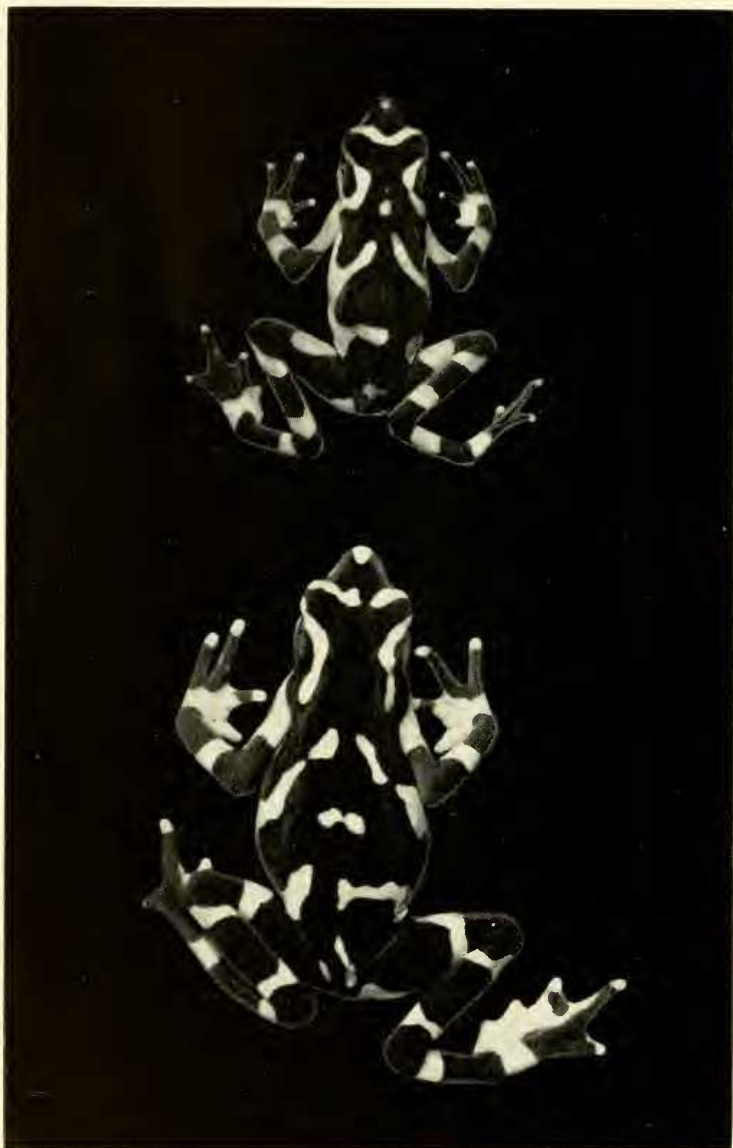


FIG. 4. *Atelopus varius varius* (Lichtenstein and von Martens). Upper fig. KUMNH No. 32866 ♂; snout to vent, 30 mm.; 15 km. SW San Isidro del General, San José Province. Lower figure, KUMNH No. 32880 ♀; length, 43 mm.; near Sarchí, San José Province.

of the back has numerous yellow dots. There is a large black area below the vent on the thighs.

No. 30299 may well represent a different form since the snout is more angulate and pointed, more flattened and projecting in profile. Much of the area under the thighs is black and four large rounded black spots are present.

This specimen from an uncertain locality (Ujarrás or Navarro) was collected by, and presented to me by Prof. Pacheco. No color notes were taken and I do not know what the color may have been in life. It is probably from an elevation higher than those I have collected. I suspect its relationship may be with *loomisi* and may represent it in the region where *varius* occurs.

Atelopus senex Taylor

(Fig. 5)

Atelopus senex Taylor, Univ. Kansas Sci. Bull., vol. 35, pt. 1, July 1, 1952, pp. 630-631 (type locality near the divide, between Volcán Poás and Volcán Barba, on western slope of Volcán Poás, Pacific drainage, elevation about 6,800 ft., Costa Rica).

Atelopus senex was described from a single specimen in the Richard Clark Taylor collection. In 1952 I acquired three specimens, KUMNH Nos. 32314-32316 from Guabata, Mt. Palomo, Costa Rica, collected by Prof. Marco Tulio Pacheco; and in 1954 another series of live specimens, KUMNH Nos. 35914-35922, from Navarro, Cartago Province, Costa Rica, presented to me by Prof. Pacheco.

The structural characters of these specimens agree well with those given for the type; however the color patterns differ much among themselves as well as from the color characters of the type.

The specimens have in common the following characteristics from which they differ from other known Costa Rican forms.

The skin on the head and most of the dorsal surface is smooth (lacking minute spicules, visible under magnification); the skin on snout (sometimes behind snout) shows one or more fine longitudinal grooves, none of which are in straight lines; the skin above the "supratympanic" ridge bears a paratoid thickening, cream white in color; the type and all of the specimens from Navarro have the venter dull gray with some indefinite lighter areas. However the three specimens from Guabata, Mt. Palomo, have the venter lighter with discrete black spots or flecks. The webbing on the feet reaches the terminal discs on all save the fourth toe and is not or but very slightly incised between. The three Guabata specimens are illustrated by a photograph showing the dorsal coloration.



FIG. 5. *Atelopus senex* Taylor. Upper figure, KUMNH No. 32314 ♀, snout to vent length, 44 mm. Lower left figure, No. 32315 ♂, length, 32 mm. Lower right figure, No. 32316 ♂, length, 33 mm. All from Guabata, Mt. Palomo, Costa Rica.

The Navarro specimens are for the most part variegated, dark gray above, often with dim light lines following the sides (seen from above), and one along the anterior part of the median line; some have guanine flecks or spots, and one specimen (No. 35916) has the top and sides of the head, and almost all of the dorsum and sides

of body covered with large cream blotches; a few even appear on limbs. Another shows similar scattered spots and flecks only on head and shoulders. The guanine spots may be entirely lacking. The thickened (glandular?) area on the "supratympanic" ridge is invariably present and cream in color.

Atelopus loomisi Taylor

(Fig. 6)

Atelopus varius loomisi Taylor, Univ. Kansas Sci. Bull., vol 35, pt. 1, July 1, 1952, pp. 625-627, fig. 7 (type locality, Isla Bonita [Cinchona], eastern slope of Volcán Poás, Heredia Province, Costa Rica, approximately 5,000 ft. elevation).

This species has been traced north and down to an elevation of approximately 1,800 feet at Cariblanco, where two specimens were taken along the Saripiquí River. The lighter dorsal areas have a little more pigment than specimens taken at higher elevation. The venters, in life, had the same bright orange-red coloration and large black spots as did the type. Since more *Atelopus* from Costa Rica have been available for study I now regard this form a species distinct from *varius*. A problematical specimen occurring south of the Meseta Central of Costa Rica may represent a subspecies of this form. See comments under *Atelopus varius varius*.

The figure shows two of the typical series: KUMNH No. 24742, paratype, 41 mm.; type, No. 24744, 44 mm.

Eleutherodactylus minus * sp. nov.

(Fig. 7)

Type: KUMNH No. 37128, 5 km. NNE Tilarán, Guanacaste Province, Costa Rica, Aug. 13, 1954; Edward H. Taylor, coll.

Paratypes: KUMNH Nos. 37126-37127; 37129-37132, topotypes, Aug. 13-15; same collector.

Diagnosis: In the *gollmeri* group (including *noblei*) but differing from *gollmeri* in having a slenderer head and body, and larger discs on fingers and toes. The first finger longer than second; a strongly defined, free-edged, inner tarsal fold about half the length of tarsus; toes at least two-fifths webbed (or somewhat more), the webs continuing as a strong fringe to the terminal discs; web reduced between the fourth and outer toe (less than one-fourth webbed); tympanum of male circular, a little more than three fourths of the diameter of eye; strong supratympanic fold continuing back in a slightly diagonal line, a branch from which goes behind tympanum.

* From Gr. *mimikos*=mimic.



FIG. 6. *Atelopus loomisi* Taylor. Upper figure, KUMNH No. 24742 ♀. Snout to vent length, 41 mm.; paratype. Lower figure, KUMNH No. 24744 ♀, paratype, snout to vent length, 44 mm. Both from Isla Bonita, Heredia Province, Costa Rica.

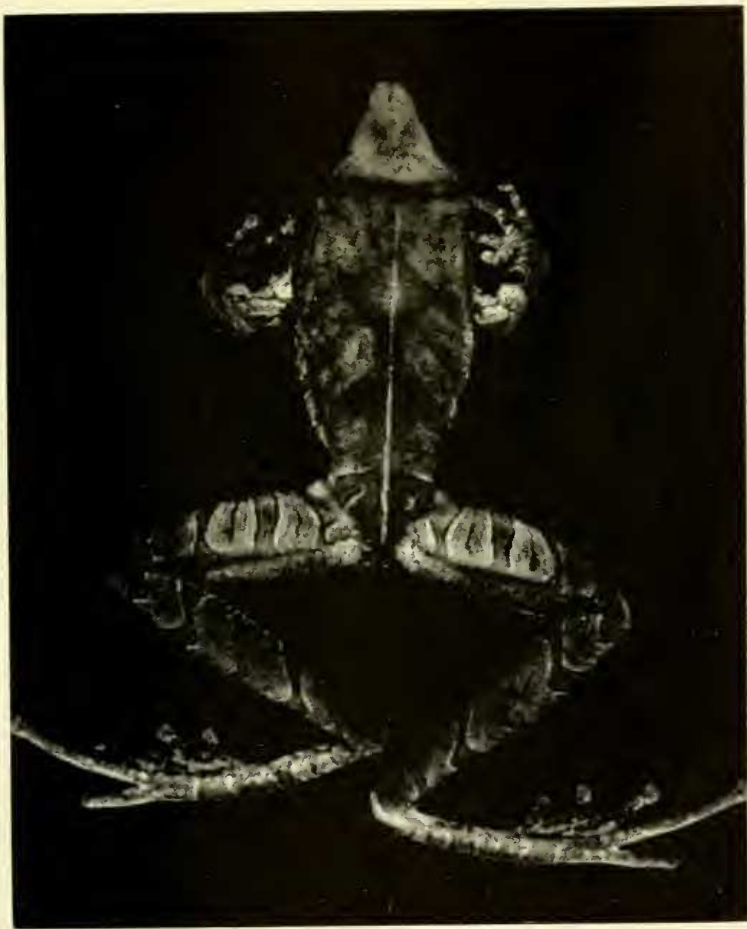


FIG. 7. *Eleutherodactylus mimus* sp. nov. KUMNH No. 37128, Type. Five km. NNE Tilarán, Las Cañas, Guanacaste, Costa Rica. Snout-vent length, 33.2 mm.

Description of species: Head slender, its length (18 mm.) much greater than its width (12.4 mm.); snout rather pointed, the tip rounded, the canthus distinct but slightly rounded; loreal region sloping precipitously,* not concave; a slight depression indicated between nostrils; head flat, except for a small ridge across the interorbital region; length of eye (4 mm.) equal to its distance from nostril; length of snout (median) 6 mm.; diameter of tympanum (3.15 mm.) at least equal to three fourths of eye length; distance

* The figure is somewhat misleading, since the dark sides of the upper jaws are not distinguishable from the background.

between eye and tympanum 1.5 mm.; snout projecting beyond mouth 1.2 mm.; tongue (7.5 mm. x 6.5 mm.) subcordiform, somewhat notched behind; choanae smaller than raised area of vomerine teeth, largely lateral; vomerine teeth behind, but within inner level of choanae, separated from choanae and each other by about the width of one series; no vocal slits or vocal sac; Eustachian tube openings much larger than choanae.

Arm brought forward, the wrist reaches tip of snout; first finger distinctly longer than second; subarticular tubercles large; three large distinct palmar tubercles, the median and outer may partially fuse; supernumerary tubercles on palm prominent; a lateral ridge on fingers scarcely discernible; terminal pads grooved transversely, outer pads a little wider than those on two inner digits, those on third and fourth a half wider than the adjoining part of finger. Leg long, the tibiotarsal articulation extending beyond tip of snout for a distance equal to one third of the tibial length; when legs are folded at right angles to the body they overlap 9.5 mm.; a sharp-edged, free, inner tarsal fold, half as long as tarsus; web reaching to middle of first finger, two thirds the length of the second and third, about one fourth the length of outer finger; discs on toes larger than those on fingers; a broad fringe on both sides of toes to disc which is wider than digit with fringe; no tubercles on sole; an elongate inner metatarsal tubercle and a much smaller rounded outer one.

Skin on much of dorsal surface smooth; two pairs of moderately distinct tubercles in shoulder region, the outer a little the larger, inner a little farther forward than outer; a strong supratympanic fold runs diagonally back from eye and continues as a free fold of skin along the sides; a pair of low tubercles behind lower edge of tympanum; a strong posttympanic fold branches from the supratympanic fold and runs down closely behind the tympanum; sides with a few minute granules; venter and chin smooth; a ventral disc limited by distinct folds laterally and posteriorly; posterior lumbar region finely granular, with larger granulations in region of vent and below it; granules present on inner part of the under side of thighs.

Color in life: Above generally dark lavender-brown; the snout to middle of interorbital region clay-white, bordered behind by a straight, narrow black line; a hair-fine median cream line, not reaching tip of snout; a dim, darker, symmetrical, dorsal pattern consisting of a diamond-shaped figure with radiating lines and a lighter center, greatly narrowed in the middle of back, then sud-

denly widened, sending two branches back diagonally; some transverse marking on back of lumbar region; side of head and tympanic area dark lavender, the color continuing on side to near venter; edge of lip a little lighter; venter and breast flesh-white; throat and chin with a scattered powdering of blackish pigment; an area under thighs and tibia pinkish. Thighs above with at least four irregular brown bars with lighter edges, separated by grayish lavender which may have narrow secondary bars; tibia with four or five, more or less chevron-shaped bands with lighter edges; tarsus and foot with indications of bars; an irregular brownish-black area at knee continued as a blackish stripe on front of tibia; sole purplish; top of foot and digits flecked with darker; palm much lighter than sole; black spots on front of arm; a dark arch about region of vent; back of thigh uniform light brown.

Measurements in mm.: Snout to vent, 33.2; width of head, 12.4; length of head, 18; arm, 17; leg, 65; tibia, 13; tarsus and foot, 27.

Variation: The general color pattern can be discerned in the paratypes if they are submerged in clear liquid but the colors on the whole are less intense in the younger specimens. One specimen has three light rounded spots on the middle of the back arranged in triangular pattern. Some of the specimens have a pair of small tubercles on the dorsal surface of the snout and the dorsal surface of the body is slightly more shagreened. The surface of the thigh and tibia also may show very fine granulations. The transverse interorbital fold, the character of the webbing of the digits, the size of the digital discs, are constant. The median light line rarely reaches the top of the head. The lateral skinfold may not always be in evidence. The females have smaller tympani that are higher than wide.

Remarks: At this type locality a specimen of *Eleutherodaetylus noblei* was taken, but the related *Eleutherodaetylus gollmeri* was not found. I have examined the types of *Lithodytes lanciformis* Cope. The head is much wider (9.8 mm. x 11 mm.). It is not impossible that *lanciformis* is identical with *noblei* but the present condition of the types makes it impossible to be certain. The pinkish coloration mentioned by Cope is characteristic of young specimens of *noblei*.

In the U.S. National Museum I have examined a specimen of this new species (number and locality not recorded by me) having a snout-vent length of 43.5 mm., arm, 22; leg, 88; tibia, 31.6; foot and tarsus, 37; heel extending beyond snout 13.5 mm. It is identified as *lanciformis*.

Eleutherodactylus vocator * sp. nov.

(Fig. 8)

Type: KUMNH No. 37001, Agua Buena, Puntarenas Province, Costa Rica, July 25, 1954, Edward H. Taylor, collector.

Paratypes: KUMNH Nos. 36999, 37000, topotypes, same collector, July 24, 1954.

Diagnosis: A diminutive frog, the head much narrower than the body; maximum known size, ♀ 17.6 millimeters; first finger distinctly shorter than second, lacking webs on both hands and feet; digital discs small on outer fingers, that on first not wider than digit and those on inner toes are not perceptibly wider than digits, while the third and fourth have discs slightly wider than adjoining part of digits and pointed rather than rounded terminally; heel reaches to eye; interorbital distance a half wider than an eyelid; a

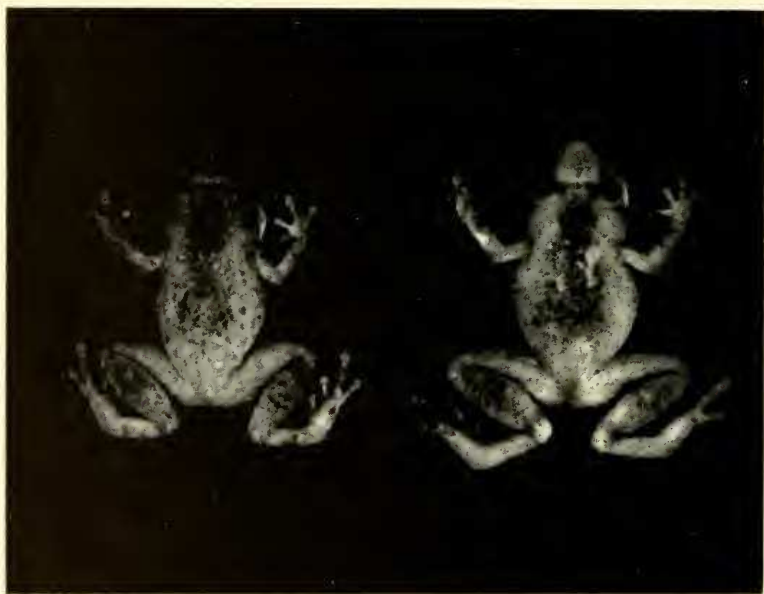


FIG. 8. *Eleutherodactylus vocator* sp. nov. Type and paratype. Figure on left, KUMNH No. 37000 ♂, paratype, Agua Buena, Puntarenas Province; figure on right, KUMNH No. 37001 ♂, type, Agua Buena, Puntarenas Province, Costa Rica, snout-vent length, 16.2 mm.

strong notch at median point of upper lip. Male with a very ample vocal pouch, the vocal slits extending back beyond mouth angle; vomerine teeth absent; the choanae lateral, concealed when seen directly from below; venter smooth, and pigmented.

* From Latin, *vocator* = one who calls.

Description of type: Head relatively small, the snout pointed (seen from above) and flattened, since the line of the mouth tends to curve up anteriorly; canthus rostralis moderately distinct, rounded; the loreal region sloping very abruptly (nearly vertical) and not concave; nostril well back from the snout tip, the distance from eye (1.2 mm) a little greater than its distance from median point on upper lip (1.16 mm.); length of eye (2.1 mm.) shorter than length of snout (median measurement 2 mm.) but less than its distance from the median point on tip measured laterally (2.45 mm.); tympanum covered with pigmented skin, the anterior outline visible, its greatest diameter .55 mm.; an indistinct fold from eye runs diagonally back covering a portion of tympanum; interorbital distance (2.35 mm.) much wider than eyelid (1.5 mm.); a strongly distensible, subgular, vocal sac which forms two strong plies when not distended; tongue much narrowed in its anterior half, then widening, its greatest length more than double its greatest width; vocal slits elongate, running back behind angle of mouth; choanae lateral, hidden when palate is seen from below; vomerine teeth absent; openings of Eustachian tubes no larger than choanae; a distinct notch in median point of upper lip; snout extending beyond line of mouth .6 mm.

Arm brought forward the wrist reaches to tip of snout; first finger much shorter than second without a widened disc, the length 1 mm.; disc on third finger pointed anteriorly; on other fingers the discs are not or but minutely wider than adjoining part of digit; subarticular tubercles flat; two palmar tubercles somewhat indistinct, the outer (median) large, subcircular.

Leg short, when folded at right angles to body heels fail to meet by one millimeter; leg brought forward, the tibiotarsal articulation reaches to near middle of eye; no trace of a tarsal fold; discs on digits not or a trifle wider than the digits, that on the fourth toe pointed and somewhat asymmetrical; subarticular tubercles flat, indistinct; some evidence of supernumerary tubercles on palm and sole; a low, rather large, inner, metatarsal tubercle, its outline not strongly defined, the outer distinct, somewhat more elevated.

Skin on dorsal part of body and head finely shagreened (seen under a lens); sides of abdomen with some granulation extending to venter; posterior part of venter with some very flat granules; posterior and part of ventral surface of thighs with relatively large, strong granules; skin of throat smooth, but distended; a pair of

tubercles below and behind tympanum and one preceding it. No ventral abdominal disc.

Color: Gray above with a narrow interorbital darker line and an elongate indefinite darker median area; a white spot on heel; on each side of the chin a lighter area. Entire ventral surface and concealed parts of the limbs pigmented, the pigment forming a reticulation leaving very numerous small rounded light areas; this likewise true of the sides of body; lips with several indefinite light flecks; a dark line follows the supratympanic fold; a light spot at (dorsal) base of each digital disc. Underside of hands and feet pigmented.

Measurements of type and paratypes 37001, 37000, 36999, respectively: Snout to vent, 16.2, 16.1, 17.6; width of head at jaw angle, 6, 6, 6.1; length of head, 7, 6.9, 7; arm, 8.6, 8.5, 9; leg, 23, 22, 23; tibia, 7.6, 7.2, 7.3; hand, 3.3, 3.1, 3.25; tarsus and foot, 10, 10, 9.9.

Variation: The male paratype agrees very closely in size as well as in other characteristics with the type, save that the dorsal pigment, and some of the lateral, tends to form dark flecks. A somewhat diagonal, lighter line follows below the diagonal dark line marking the supratympanic fold. The female paratype is dark, appearing nearly black on head and shoulders. However lighter flecking occurs on the sides, rump, and to some extent on limbs. Lateral light areas are present on sides of the chin and the white flecks on the darker venter are more conspicuous, as is the heel-spot. The female, as well as the males, is adult and the abdomen is distended with four, large, yellowish eggs.

Remarks: A related species *Eleutherodactylus diastema* was described from a specimen taken by John M. Bransford on the Panamanian (not Nicaraguan) Canal Survey of 1874. The exact locality is given as "Camp Mary Caretta" but a manuscript label is said actually to read Camp Margharettia, and the suggestion has been made that Margarita, near Colón, is intended. In the specimens I have identified as belonging to Cope's *Lithodytes diastema*, the adult males and females are considerably larger than males or females of this species. The female of *diastema* may lay as many as ten eggs measuring four millimeters in diameter. The yolk of the egg is cream completely lacking in dark pigment. At Cervantes, Cartago Province, this species has been taken chiefly in bromelias at about 4,800 ft. elevation. Here the species is common, some plants yielding half a dozen specimens, all showing considerable variation in color and marking. The eggs of that

species are frequently found in the bromelias. These are usually laid so they are not submerged, the young having a direct transformation typical of most, if not all, Costa Rican *Eleutherodactylus*. Several females may lay their eggs together in a single plant, and at different times, since sets, differing in degree of development, may be found side by side.

Noble (1918) also described a form from Nicaragua under the name of *Hyla chica*. He considered that the clawlike terminal phalanges placed the frog in the family Hylidae. However the life history involving the absence of a free swimming stage (as well as other considerations) seem certainly to place his form in *Eleutherodactylus*. I have not examined the type but consider it likely, that, if not a definitive form, it belongs with *diastema* rather than with *vocator*.

The most outstanding differences between *vocator* and *diastema* are that the former has smaller, differently shaped, terminal digital discs, and the head is more pointed, and presumably the species fails to attain as large a size. The species probably occupies the Pacific slopes of the Talamanca Range, and the Brunqueña Mountains. Many were heard at Agua Buena and presumably also in the mountains above San Isidro del General but no specimens were found in the latter locality. In northern Costa Rica along the Pacific slopes of the Cordillera Volcanica they were neither heard nor seen.

Eleutherodactylus diastema (Cope)

(Fig. 9)

Lithodytes diastema Cope, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 8, 1876 (1875), pp. 155-156 (type locality "Camp Mary Caretta," Panamá).

This species was not figured in my paper, "A Review of the Frogs and Toads of Costa Rica" (Univ. Kansas Sci. Bull., vol. 35, pt. 1, 1952, pp. 701-703) hence I am presenting here a photograph of four specimens to show color-pattern variation. This may serve as a basis of comparison with the figure of *Eleutherodactylus vocator* herein described.

GENUS AGALYCHNIS Cope

Agalychnis Cope, Proc. Acad. Nat. Sci. Philadelphia, 1864 (Aug. 30), p. 181 (type of genus *Hyla callidryas* Cope)*; *idem*, p. 182; Nat. Hist. Rev., 1865, pp. 110 (embraces *H. moreletii*, *H. holochlora* and *H. callidryas*).

On the night of Aug. 14, 1943, a large pond was visited at a point some 4 kilometers NNE of Tilarán. Large numbers of amphibians

* Taylor, Univ. of Kansas Sci. Bull., vol. 35, pt. 1, 1952, p. 801, incorrectly states that *Hyla moreletii* is the type of genus.

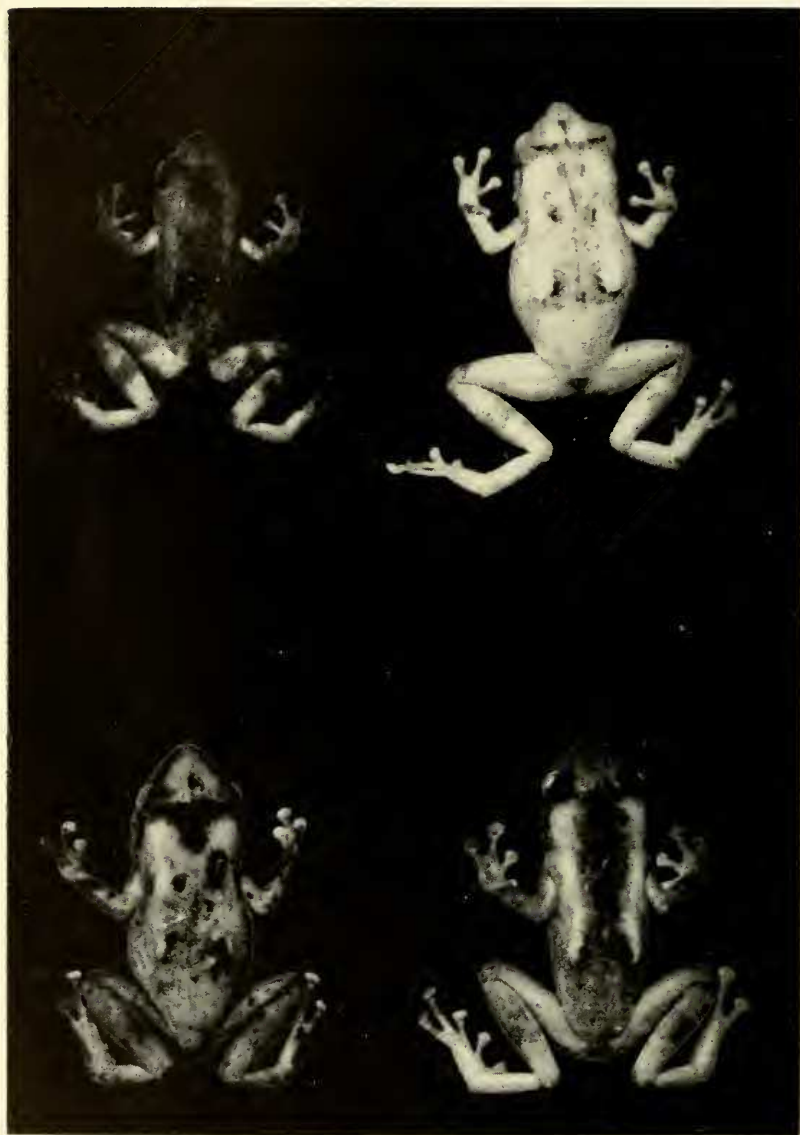


FIG. 9. *Eleutherodactylus diastema* Cope. Upper left, KUMNH No. 31643 ♂, snout to vent length, 19 mm.; upper right, No. 31633 ♀, length, 22.2 mm.; lower left, No. 31672 ♀, length, 24 mm.; lower right, No. 31629 ♀, length, 24 mm. All from Cervantes, Cartago Province, Costa Rica.

composed of several species were calling from the shores or from weeds partly submerged and together their voices blended into a great chorus. Several were found breeding. In the weeds partly covered with water and in trees and shrubs along the edge of the pond very large numbers of breeding *Agalychnis callidryas* were found—the number of males seemingly exceeding the number of females. Near one end of the pond (approximately 200 meters in length), a second but smaller species of *Agalychnis* was found, these seemingly occurring in smaller numbers and it was presumed that these were not breeding. Ten adult males and one female were collected and several young that were partially or completely transformed. Certain young and one adult male were found on plants and shrubs three hundred meters from the pond and perhaps a hundred meters higher than the pond level. In contrast more than fifty adult *callidryas* were collected at the pond and a much larger number could have been acquired with ease. Many of these were clasping and eggs were found on leaves above the water. No young specimens or larvae of this species were taken.

The smaller species belongs in the section of the genus that includes *dacnicolor*, *alcorni*, and *moreletii*, the latter of which also occurs in Costa Rica. However the species is distinct, and I believe, unnamed. It is described below.

Agalychnis saltator * sp. nov.

(Fig. 10)

Type: KUMNH No. 35615, 4 km. NNE of Tilarán, Guanacaste, Costa Rica, Edward H. Taylor, collector.

Paratypes: 35609-14; 35616-26. Topotypes. Prof. Marco Tulio Pacheco, Srta. Georgiana Pacheco and Edward H. Taylor, collectors.

Diagnosis: A small species, the largest male 44 mm., the single female 52 mm.; eye reddish; body lacking lateral black and cream markings; width of interorbital region equal to, or minutely greater than, width of an eyelid; canthus rostralis indicated but rounded; no paratoid; digits less than half webbed on feet, less than one third webbed on hand; skin-fold above tympanum obsolete but very strong behind tympanum, continuing above arm; heel to front of eye; tympanum very distinct, its diameter slightly less than half length of eye; green above with narrow, dim, wavy, darker, transverse lines indicated on body; a cream spot at posterior corner of eye.

* Latin, *saltator* = leaper.



FIG. 10. *Agalychnis saltator* sp. nov. Type. KUMNH No. 35615, four km. NNE Tilarán, Guanacaste, Costa Rica. Snout vent length, 44 mm. (transverse dark lines, visible to the eye, are scarcely shown in the photograph).

Description of type: Head triangular, wider than the body; no paratoid present; canthus indicated, curving forward, rounded; areas about nostrils swollen with a slight depression between; in profile, snout sloping down to edge of lip; distance between eye and nostril (4 mm.), greater than distance between nostril and median notch on upper lip (3.2 mm.); loreal region sloping

broadly to lip, not or but slightly concave; narrowest interorbital distance (4.3 mm.) greater than an eyelid (4.1 mm. flattened); tympanum circular, its diameter (2.4 mm.) less than half length of eye-opening (5.2 mm.); eye to tip of snout 5.3 mm. (median measurement); upper eyelid folds down somewhat over eyeball; lower lid with cream venation; large vocal slits in floor of mouth extending but little forward of the mouth angle; tongue longer than wide, notched behind, free for nearly half its length and free on sides; choanae large, the vomerine teeth in two tiny fascicles, between the anterior borders of choanae, separated from each other by a distance equal to one fascicle and from edge of the laterally placed choanae by a somewhat greater distance; openings of the palatal glands form an indefinite line nearer tip of palate than anterior level of choanae; upper arm slender, pigmented above, forearm thickened with a prominent "elbow"; a cream skinfold beginning behind elbow runs along outer ventral surface of arm and is more or less evident to base of outer finger; first finger much shorter than second, the disc widened, a little smaller than tympanum; discs on two outer fingers a little larger than second, and double width of first; web between first two fingers short, failing to reach to level of the subarticular tubercle of first and not half way to tubercle on second finger; between second and third to upper level of tubercle on second, to base of tubercle on third; between two outer fingers web reaches half way to tubercles—all webs continuing to discs as a thick fringe; tubercles on two outer fingers bifid; palmar tubercles not strongly defined, that at base of first finger flat, oval; two small tubercles on palm; well-defined supernumerary tubercles; first finger on inner dorsal surface with a patch of small brownish nuptial spines; leg relatively short, the heel reaching front edge of eye or slightly farther; when legs are placed at right angles to body, heels overlap three millimeters; tarsal fold very indistinct save for an irregular row of minute granules; outer fold barely indicated by a white line; first toe shorter than second; two inner toes less than a third webbed; between second and third, web reaches to middle of distal tubercle of second toe; between third and fourth, web reaches to base of distal tubercle of third and between two outer toes to about the same distance; webs continued to discs as a fringe; discs on toes smaller than those on second finger; inner metatarsal tubercle narrow, elongate, outer farther forward, distinct, small; subarticular tubercles and supernumerary tubercles present.

Skin on dorsum, head, and above thighs with small granules or corrugations, not equally distributed, but very distinct especially on sides of head; tympanum somewhat elevated, thinly covered with skin; back edge of tibia rather sharp; region of vent sticking out behind level of thighs, the skin flap covering the vent does not reach down quite to level of vent; on chin, skin wrinkled but without distinct granulation; venter strongly granular; inner part of thigh with small granules intermixed with larger granules, the latter forming an indistinct row on posterior edge; the skinfold from eye is obsolete above tympanum or dimly indicated, prominent behind tympanum.

Color in life: Above dark leaf-green with dim indications of transverse, darker, wavy lines or spots on dorsum; ventral and concealed surfaces of limbs, yellow orange. The green color covers only outer finger and part of two outer toes; front and back of thigh and part of upper arm lavender, the green color forming a narrow line on top of thigh. Area about vent somewhat whitish; a cream-white spot at back corner of eye; eye reddish.

Measurements in mm. of type and No. 35622 ♀: Snout to vent, 44, 52; width of head, 15, 17; length of head, 15.2, 18; arm, 29, 34; hand, 13, 14; leg, 68, 78; tibia, 22, 25.4; foot and tarsus, 28, 33.

Variation: When first taken all the adults were of practically the same shade of green and orange. In preservation part of the specimens have become brownish or brownish lavender with a frosting of bluish white over the dorsal surfaces. The darker transverse markings can be seen below this color, and in No. 35625 the markings are rather clearly defined. The orange coloration is lost leaving these pigmentless surfaces white.

Relationship: The relationship, based on the absence of lateral cream and purple markings, is seemingly with *Agalychnis moreletii*. The latter species is much larger (nearly 25 percent in linear measurement and more than double the volume). The skin is smoother, and the supratympanic fold well developed above tympanum; the tympanum is less well defined and the webbing on fingers and toes is greater. The vent opens downward at level of venter.

Remarks: Besides the series of *Agalychnis saltator*, the following species of amphibians were taken at the pond on the same evening: *Smilisca baudini*, *Hyla underwoodi*, *Hyla loquax*, *Hyla ebraccata*, *Bufo coccifer*, *Hyla phaeota*, *Agalychnis callidryas*, *Leptodactylus melanonotus*.

REPTILIA

GENUS EUMECES Weigmann

Eumeces Wiegmann, *Herpetologia Mexicana*, 1834, p. 36 (type of genus *Scincus pavementatus* = *schneideri*).

This cosmopolitan genus occurs in the Western Hemisphere from Canada throughout most of the United States and Mexico, and into Central America but the number of species dwindles until only three are known south of the Isthmus of Tehuantepec. Two of these extend into northern Central America, *Eumeces schwartzi* having been taken in northern Guatemala and *E. sumichrasti* in northern Honduras. The third species, originally discovered in Managua, Nicaragua, is here traced south into Costa Rica and presumably it is the only known species of the genus occurring there. Four specimens were taken.

Eumeces managuae Dunn

(Fig. 11)

Eumeces taeniolatus (non Blyth) Boulenger, Catalogue of the lizards in the British Museum, vol. 3, 1887, p. 383 (type locality [in errore] "Punjab, India").

Eumeces managuae Dunn, Proc. Biol. Soc. Washington, vol. 46, 1933, p. 67, 68 (type locality, aviation field Managua, Nicaragua); Taylor, Univ. Kansas Sci. Bull., vol. 23, pp. 104-110, pl. 3, figs. 6, 7, 8.

Diagnosis: A large species of the genus characterized by a greatly expanded series of median dorsal scutes; four pairs of expanded nuchals, one postmental, a postnasal; large auricular lobules; subcaudals transversely widened; adpressed limbs widely separated; gray or gray-brown above, the dark color tending to form elongate lines.

Description of species. (From KUMNH No. 34185, Tenorio, Guanacaste, Costa Rica). Rostral large, much wider than high, the part visible above forming a very obtuse angle, its length less than that of the supranasals; latter moderate, broader than long, the length of the median suture distinctly less than the greatest length of the scale, which is less than its width; the nasal is definitely divided; frontonasal much larger than the prefrontals, wider than long, forming a suture with the frontal and at same time separating the prefrontals; latter generally pentagonal, touching two loreals laterally, and touching the frontonasal, frontal, first supraocular, and first superciliary; frontal angular anteriorly reaching its greatest width between the first supraoculars, and then narrowing slightly posteriorly, bounded laterally by two supraoculars and behind by the paired frontoparietals, and not making a suture with the interparietal (as in the type). Interparietals a



FIG. 11. *Eumeces managuae* Dunn. KUMNH No. 34185, Tenorio, Las Cañas, Guanacaste, Costa Rica. Total length, 282 mm.

little smaller than the prefrontals (much smaller in the type) their mutual suture about one third of their length, and touching three supraoculars laterally; parietals not separated by the interparietal, their posterior inner edges forming a suture; four pairs of widened nuchal scales; a postnasal present behind the posterior nasal; two loreals, the anterior higher and much widened at top, and generally slenderer than posterior; four supraoculars, the second largest; three well-defined presuboculars, eight superciliaries, three or four small preocular scales, one touching the loreal; four postsuboculars; primary temporal small, quadrangular; secondary temporals large, the upper elongate, the lower triangular; tertiary temporal present. Seven supralabials followed by two superimposed pairs of postlabials. About 27 irregular scales about ear-opening, three of the anterior scales form lobules; five supralabials preceding the subocular supralabial; mental bordering mouth a somewhat longer distance than rostral, nearly twice as wide as deep; seven infralabials; a single postmental followed by three pairs of chinshields, only the first pair forming a median suture; scales on dorsum from parietal to above vent, 67, of which four are nuchals, followed by seven large paired scales, and these in turn followed by 56 widened body scales; scales about anterior part of neck, 31; about narrow part of neck, 23; about middle of body, 17; about axillary region, 26; about base of tail, 13. A total of 83 subcaudals, all about five times as wide as long except two pairs following the vent (the distal part of the tail is regenerated); a tiny patch of granular scales in axilla and a similar elongate patch behind leg insertion.

Third and fourth fingers equal in length, each with twelve scales on under surface; palm with three light padlike scales larger than others; fourth toe distinctly longer than third with sixteen keeled scales below; three large padlike scales on heel.

Color: Above rather yellowish brown, the head somewhat lighter, rather more grayish brown on sides; a light lemon-yellow wash

Measurements of *Eumeces managuae* Dunn

Number	34185	34186	34187	34188
Sex.....	♂	♂	yg	yg
Snout to vent.....	125	104.5	62	57
Tail.....	157	145.5	30 reg.	41 broken
Snout to eye.....	8	7.2	4.8	4.4
Snout to foreleg.....	36.5	32	20	20.2
Axilla to groin.....	74	60	36.5	33
Arm.....	22	22	13	12
Leg.....	30	27	16	15
Width of body.....	19	16.5	11	9
Width of head.....	16	14	9	8.5

on venter; chin whitish; the dorsal scales with one or two darker areas that form discontinuous darker lines, two median, and one each on other scale rows; chinshields and six ventral rows immaculate flesh with dark flecks appearing at base of tail and growing more numerous toward tip; each labial with a dark spot; each head scale with a darker mark, some with more than one.

Variation: Nos. 34186 and 34187 have the frontoparietals separated instead of forming a suture, while 34189 has them touching at a single point.

In the two young specimens the outer ventral scale rows may have some dark flecks. The general color above is wood-brown with the dark lineation strong and continuous. In the younger specimen the yellow of the venter is more pronounced. It is remarkable that these specimens were collected on an airfield as was the type.

They were found burrowing under the edges of small boulders and two were taken from a small pile of stones. Certain others seen escaped into masses of growing cacti about rocks. This is the southernmost record of the genus *Eumeces* in the Western Hemisphere.

GENUS ANADIA Gray

Anadia Gray, Catalogue of the specimens of lizards in the collection of the British Museum, 1845, p. 74 (type of the genus, *Anadia ocellata* Gray).

Diagnosis: Slender, elongate lizards, the head narrowed and rather pointed. Head with regular shields; frontonasal present separating nasals; nostril in a single nasal, or in a suture between two nasals; eyelids developed, with a divided transparent disk on lower lid; scales smooth, juxtaposed, or slightly imbricate, forming transverse rows; ventrals equal to or a little larger than dorsals, quadrangular, forming transverse and longitudinal series. Tail cylindrical; lateral teeth compressed, tricuspid; tongue bifid, somewhat arrow-shaped; auricular opening present; limbs rather weak, pentadactyl. At least some forms are arboreal.

This genus comprises some nine or ten species distributed chiefly in northern South America. Only a single species is known in Central America. This was described in 1875 by E. D. Cope as *Chalcidolepis metallicus* from a single specimen collected by William Gabb in the Aguacate Mountains of Costa Rica. Later Cope (1885) placed his *Chalcidolepis metallicus* in the genus *Leposoma*.

The genus was reviewed by Arthur Loveridge in 1929, and a new species, *Anadia nicefori*, was described from Colombia. In the same paper he reports another specimen of Cope's species from Costa Rica.

Burt and Burt in 1933 again list the South American species of the genus. Dunn, in 1944, reviewed the Colombian species, describing a new form, and listing, in all, six species for Colombia. He places *Anadia nicefori* in the genus *Ptychoglossus*.

To the best of my knowledge the genus is still unreported in Panamá. The Costa Rican material of the genus has been scant. Mr. Loveridge has loaned me two Costa Rican specimens from the Harvard collection. There are three in my Costa Rican collections.

KEY TO FORMS OF ANADIA IN COSTA RICA

1. Femoral pores, 3-2; 23 scales about body; 56 transverse dorsal rows between parietal and back level of thigh; brown above with a row of blackish scales on each side.....*metallica metallica* (Cope)
Femoral pores, 5 or more; more than 25 scales around body..... 2
2. Femoral pores, 5-5; 28 scales about body; 63 transverse scale rows between parietals and back level of thighs; back heavily spotted with black.....*metallica arborea* subsp. nov.
Femoral pores, 9-10; 28-31 scales about body; 52-56 scales between parietal and back level of thighs; black spotting on back reduced or absent.....*metallica attenuata* subsp. nov.

The material is inadequate to determine positively whether we are dealing with species or subspecies. One may presume that *metallica* occupies the Pacific drainage of the Aguacate mountains and perhaps also of the adjoining Talamanca Range; *arborea* the Pacific slopes of the Cordillera Volcanica; and *attenuata* the Caribbean drainage of the Meseta Central and the eastern slopes of the Talamanca Range. It may be doubted that the barriers are such as to bring about complete isolation. An accumulation of series from a given locality will permit one to determine the extent of variation and a clearer interpretation of the relationships as to whether they are specific or subspecific.

One other fact suggesting the closer relationship is that the light color on the side of neck and upper lip (including lower eyelid) seemingly is nearly identical in the three forms, and at least in two there is a row of widely spaced light dots from above arm insertion to the groin, some of which may have dark borders. However, this condition obtains also in certain species occurring in South America.

Anadia metallica metallica (Cope) (new combination)

Chalcidolepis metallicus Cope, Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 8, 1876 (1875), pp. 116-117, pl. 24, fig. 5; pl. 28, fig. 2 (type locality, "Aguacate Mountains," Costa Rica, William Gabb, coll.).
Ecleopopus (*Chalcidolepis*) *metallicus* Bocourt, Mission Scientifique au Mexique et dans l'Amérique Centrale; Étude sur les Reptiles et les Batraciens, livr. 6, 1879, pp. 371-372.

Leposoma metallicum Cope, Proc. Amer. Philos. Soc., vol. 23, no. 121, Jan. 1886, pp. 97-98; U. S. Nat. Mus. Bull. no. 32, 1887, p. 45.

Anadia metallica Günther, Biologia Centrali-Americana; Reptilia and Batrachia, Aug. 1885, p. 30; Boulenger, Catalogue of the Lizards in the British Museum, 2nd ed., vol. 2, p. 400; Loveridge, Proc. Biol. Soc. Washington, vol. 42, Mar. 25, 1929, pp. 99-102 (*part.*).

Diagnosis: A slender lizard with a tail nearly twice length of head and body; snout-to-vent length, 58 mm.; head narrowed, pointed; limbs with five digits, all clawed; 23 scales in a transverse row around body, subequal in size; frontonasal single, separating nasals; 55 scales from parietals to level of posterior face of femur; two large preanal scales preceded by a somewhat smaller pair; occipitals enlarged. Teeth compressed with a central cusp flanked by a denticle on each side.

Description of species: (Data from Cope's type description). A slender lizard with a very long tail and feeble limbs; head narrowed and acute in front, with a produced rostral shield; frontonasal as wide as long; frontal elongate, two prefrontals, two frontoparietals, two parietals separated by an interparietal; four supraoculars; interparietal elongate having sutures parallel to the larger parietals; latter bounded externally by a large temporal, forming with them a diagonal suture; these all are bounded posteriorly by a series of four shields across the occiput, and these in turn by a transverse series of seven scales larger than those on the nape following them; nasal followed by a large loreal and this by a smaller preocular; seven supralabials, 4,3,1,2,6,7,5, being their diminishing order of size; two pairs of chinshields in contact in median gular region, the posterior pair being twice as long as the first. Nostril in a single nasal plate, tympanum distinct.

Dorsal scales all smooth in uninterrupted transverse annuli round the body, the size subequal on the various regions including the nuchal and gular; twenty scales in a cross-row between the angles of the lower jaw; scales in pectoral region irregular, the last row of the neck having the appearance of a collar; a series of 23 scales in an annulus of the body; twelve transverse rows between large postoccipital row and line of axillae; between this line and posterior line of thighs, 43 scales. There are two large, longitudinal, anal scales, which embrace a scale between them on the anal border; these preceded by another pair, but of reduced size.

Toes 5-5, all clawed. Tail nearly twice head-body length; hind limb one fourth head-body length. Limbs surrounded by large scales except on concealed faces of humerus and femur, where

the scales are small and flat; lower eyelid dried so its characters are obscured.

Color: Light gray with red and green metallic reflections; sides brown, the middle of back darker than a line above the brown of the side; near the light dorsolateral lines, a few scales are blackish, forming a row on each side; venter dusted with brown; head with deep brown sides and a white upper lip; sides of tail brown with a zigzag upper margin.

Measurements in mm.: Total length, 165; head-body length, 58; tip of snout to axilla, 17; length of head to tympanum, 11; length of head to orbit, 4.5; length of arm, 13; length of leg, 14.5.

Remarks: Cope's figure 5, plate 24, is perhaps a bit diagrammatic. There is no suggestion of the lateral series of separated light spots. Figures 2a and 2b, plate 28 are presented on a small scale but the conformation of the chinshields do not conform to the description since the second pair is shown to be very small. A third pair which is not mentioned are large, and separated from each other.

Dr. Doris Cochran has kindly re-examined the type. She writes:—"The type of *Chalcidolepis metallicus*, USNM 30568, is not in the best shape, being pretty dry, and having lost its left leg. Its right leg shows 3 femoral pores, the 3rd quite faint. Perhaps there are only 21 or 22 scales around the body,—it is too brittle to say exactly. The nasal and first labial are broadly in contact. The first pair of chinshields are as long as the mental; the second pair is a little longer than the first; the third pair is shorter than either pair 1 or pair 2, and are separated by a small scale, while the first two are entirely in contact."

It would appear that the specimen was dried when received by Cope (since he at least mentions the fact that the eyelid is dried) and the femoral pores were overlooked or an incorrect statement set down concerning them. He states—"no femoral pores."

*Anadia metallica attenuata** subsp. nov.

(Fig. 12)

Type: KUMNH No. 34223 ♂ from Pacuare, Río Pacuare, on road between Turrialba and Moravia de Chirripó, Cartago Province, Costa Rica; Aug. 17, 1951, Edward H. Taylor, collector.

Paratype: KUMNH No. 34224, Moravia de Chirripó.

Diagnosis: Frontonasals separated from the first labial or not;

* Latin, *attenuatus* = drawn out.

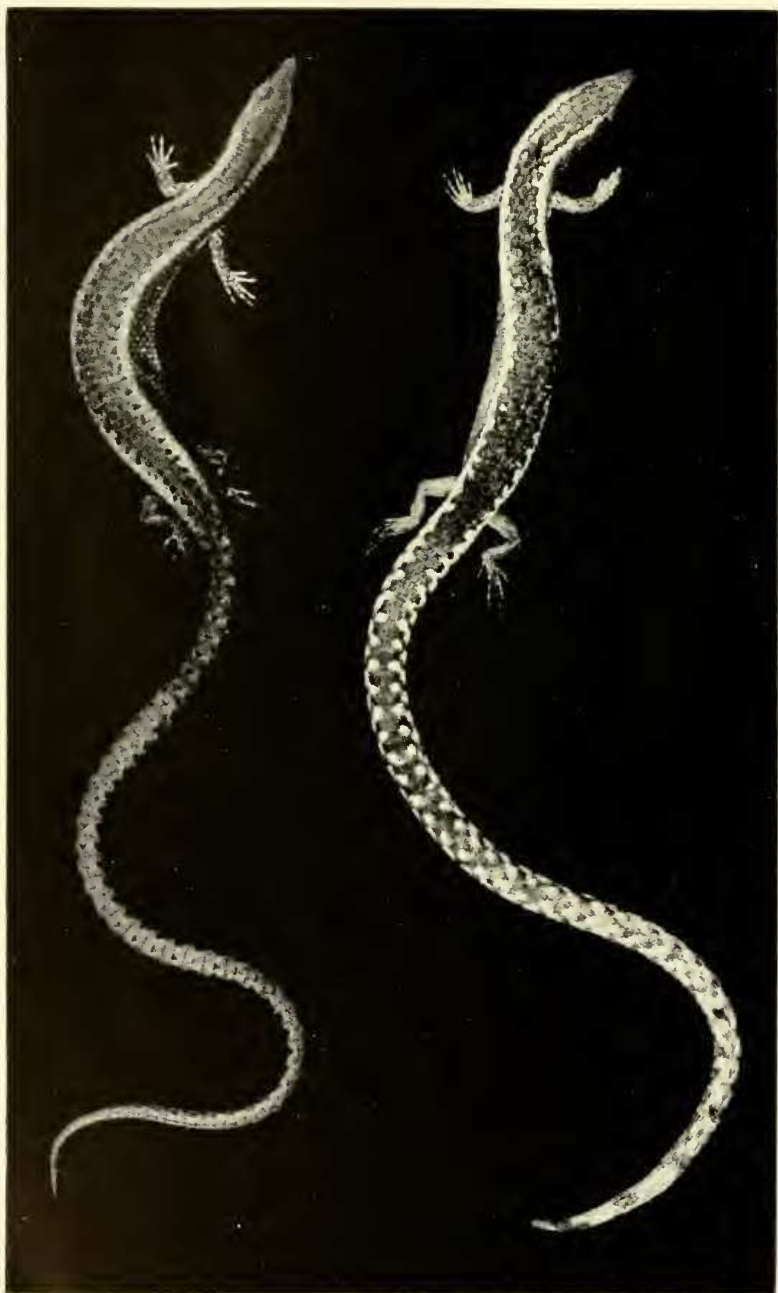


FIG. 12. *Anadia metallica attenuata* subsp. nov. Type and paratype. Left figure KUMNH No. 34224, paratype, Moravia de Chirripo; figure on right, type, KUMNH No. 34223, Pacuare, Río Pacuare, on road between Turrialba and Moravia de Chirripó; actual length, 177.5 mm.

rows of black dots on dorsal surface reduced or absent; dorsolateral light line extending to tail, then breaking up into two series of small clay-white spots; a series of small white or cream dots on sides from axilla to groin, those near axilla with dark borders; 9-10 femoral pores; 28-31 scale rows around middle of body; 14 rows of gular scales between chinshields and nuchal collar; scales from parietals to back level of thigh, 53-56.

Description of type: Body slender, the basal region of the tail plump and nearly as wide as body for some distance; rostral large, the part visible above about half length of frontonasal; latter longer than wide, separated from the first labial by the nasal; prefrontals rather large, each nearly half the area of the frontonasal, touching nasal, loreal, and first supraocular laterally; frontal widened anteriorly, narrowed posteriorly, about as long as frontonasal; four supraoculars, first small, three touching frontal; a pair of small frontoparietals, each touching frontal, two supraoculars, a parietal and an interparietal; interparietal shaped somewhat like frontal, the widened part posterior, the sides definitely not parallel; parietals large, their posterior part forming less than a right angle, each touching last supraocular, upper postocular, and three other large scales; the parietal series bordered behind by a row of specialized postparietals; some of the scales of the temporal area enlarged, one bordering the auricular opening; nasal single, nostril above middle of first labial; a large loreal, nearly as high as long; five supraciliary scales; four postoculars; supralabials 7-7, the fourth largest, the fifth smallest; ear-opening less than half length of eye-opening; 6-6 infralabials, the last small; mental about size of rostral; a large azygos postmental; three pairs of chinshields, the last pair largest, forming a short median suture anteriorly, separated posteriorly by two scales; first transverse gular row consisting of eight scales, the outer very large, separated from sixth infralabial by one narrow scale; 15 rows of gular scales including "collar" series; lateral scales narrower than dorsals or ventrals; small scales present about limb insertions; all scales smooth, the dorsals quadrangular, somewhat imbricating; very large scales on limbs save on underside of upper arm, and ventral and posterior part of thigh; soles, palms and basal joints of digits with padlike lamellae, only one or sometimes two divided on each toe; on two terminal joints of each digit, lamellae compressed; a strong terminal claw.

Scales in a row about middle of body, 31; dorsal scales from parietals to back level of thigh, 52; scales from posterior chin-

shields to front level of thigh, 50; subcaudals (tip of tail regenerated), 95; six preanal scales, the four median longest, second row with four scales.

Color in life: Dorsum somewhat mottled olive; head lighter with a very indefinite pattern; a pair of dirty-white or clay dorsolateral lines extending from anterior supraoculars to tail where they tend to break up on each side into two more or less regular series of cream-colored spots, but becoming more irregular towards tip of tail; a pair of short light lines in nuchal region; a brown stripe with darker edges begins behind eye, continues on neck and side of body to tail, growing lighter and more indefinite posteriorly; a few ocelli in axillary region continuing as a series of indefinite light dots to groin; limbs variegated cream-white and light brown; chin, throat, breast, and underside of arms almost pure white; venter dirty white with a very fine sprinkling of gray pigment, usually concentrated into indefinite areas on each scale; underside of tail with a light salmon wash and with some fine, scattered, brownish pigment.

Measurements in mm: Snout to vent, 58.5; snout to arm insertion, 18.7; axilla to groin, 33.5; tail, 119 (tip regenerated); total length, 177.5; arm, 12; leg, 15.5.

Remarks: The type locality is only a few kilometers from Moravia de Chirripó, where another specimen was obtained. The type specimen was captured in a field recently cleared of forest trees. The rather heavy claws suggest that the species is arboreal rather than terrestrial.

Variation: A second specimen referred to this subspecies is KUMNH No. 34224 from Moravia de Chirripó; and while not agreeing in all details it does agree in essential characters. The specimen is a female taken from a bromelia in a forest tree at some distance from the ground.

Direct comparison with the specimen just described shows but little difference in head squamation. The large frontoparietal separates the nasal from the rostral, and the interparietal has parallel sides. The supralabials are 7-6, the fourth and fifth being fused on the right side; however, there are 6-6 infralabials due to a segmenting of the large first infralabials. The scale counts from occiput to posterior level of thigh is 54; there are 16 gular and 36 transverse ventral scale-rows and 28 scales in a row around body.

The color differences are due largely to a row of small dark dots rarely covering a single scale completely. There is a small part

segmented from the third supraocular on the right side, two segments on the left side. The preanal series consists of five elongate scales preceded by a series of four smaller scales. The female has 2-1 minute femoral pores, and these are smaller than those in the male. There are two oviductal eggs present.

A specimen collected by Mr. C. H. Lancaster at Cachí, Cartago Province, "arbórea sobre el terrá, Nov. 1910. (3,300 ft.?) on the south bank of the Río Reventazon," has been forwarded to me by Mr. Arthur Loveridge. This specimen is the one mentioned by Mr. Loveridge (Proc. Biol. Soc. Wash., vol. 42, 1929, pp. 99-102).

The specimen is somewhat faded and the dorsolateral light lines are discernible when submerged in alcohol, and the inner edges are darker than the outer. No black dorsal spots can be discerned. The olive brown lateral stripe from snout passes through the eye and along the side of the head and is lost on the side. The venter is pigmented somewhat, the chin, lips, and throat cream. The tail has been broken 26 millimeters behind the vent and the broken portion of the tail is almost uniformly cream white with little or no evidence of pigment. The basal portion of the tail shows considerable pigmentation. There are 28 scale-rows around the middle of body, and 52 scales in a longitudinal row from parietals to back level of thigh; femoral pores, 8-9; caudal whorls, 113; third pair of chinshields separated; six preanal scales, preceded by two scales; snout-vent length 57 mm., tail 144 mm. On one side the nasal touches the rostral; on the other it fails to touch, while the first labial touches the frontonasal. There is no scale segmented from the third supraocular.

Another Costa Rican specimen from "Santa Teresa" Costa Rica (a locality I do not find on my available maps) collected by Dr. Dodge "in jungle" was also loaned by Mr. Loveridge. This specimen is presumably a recent hatchling and presumably is a female. The minute femoral pores are 3-4; the caudal whorls are 109; the scales in a dorsal row 56; and there are 28 scales in a row surrounding the middle of the body. The adpressed limbs touch in this specimen while in all others here reported the adpressed limbs are separated by from 10 to 14 annuli. I am uncertain whether this is purely a juvenile character or not, but presume that it is.

The color pattern is strongly defined. The area between the dorsolateral lines shows a vermiculating reticulation of brown while anteriorly on the head the color is dark olive, more or less uniform;

dorsolateral light lines are well defined; a lateral brown stripe begins at the nasal, passes through eye, includes the upper half of the auricular opening and continues to the groin; a row of about 13 unequally spaced cream spots surrounded by black color begin above arm insertion and continue to above leg insertion, the posterior ones less distinct and lacking dark borders.

In this specimen the frontonasal makes a considerable suture with the labial anterior to the nasal and the interparietal is proportionally more elongate than on the other specimen. A small scale is segmented from the outer part of the third supralabial (as is true of KUMNH Nos. 34223, 34224, and 34225, but this is not true of MCZ No. 15386 from Cachi. Until the adult characters of a male specimen is known the placing of this female form will remain in doubt.

This specimen measures 70 mm. in total length; snout to vent, 26 mm.; the greatest width of head, 4 mm.; arm, 6 mm.; leg, 8.2 mm.

Anadia metallica arborea * subsp. nov.

(Fig. 13)

Type:—KUMNH No. 34225, from Las Flores, Tenorio, Las Cañas, Guanacaste Province, Costa Rica, Aug. 22, 1952; John Baker and Edward H. Taylor collectors.

Diagnosis: A slender, elongate species, the male with 5-5 femoral pores; 63 transverse dorsal scale series between parietal and back level of thigh; back heavily spotted with black, the spots covering from two to four scales; 28 scales in a row about middle of body.

Description of type: Body elongate, slender, the tail twice head-body length; head slender, the snout narrowed, rounded at tip; rostral large, in contact posteriorly with two labials and the frontonasal, the suture with the latter curving, the length of part visible from above about half length of frontonasal; latter single, seven-sided, forming a considerable suture with first labial anterior to the nasal; prefrontals rather large, nearly half the area of frontonasal, laterally touching the nasal, loreal, and the diminutive first supraocular; frontal relatively small, larger than the prefrontals, smaller but equally as long as the frontonasal; frontoparietals small touching frontal, two supraoculars, interparietal, and parietals; latter scales very large, terminating posteriorly in an acute angle, separated by a parallel-sided interparietal; the parietals touch last supraocular, upper postocular, and two temporals, the upper of which is

* Latin, *arboreus* = of the trees.

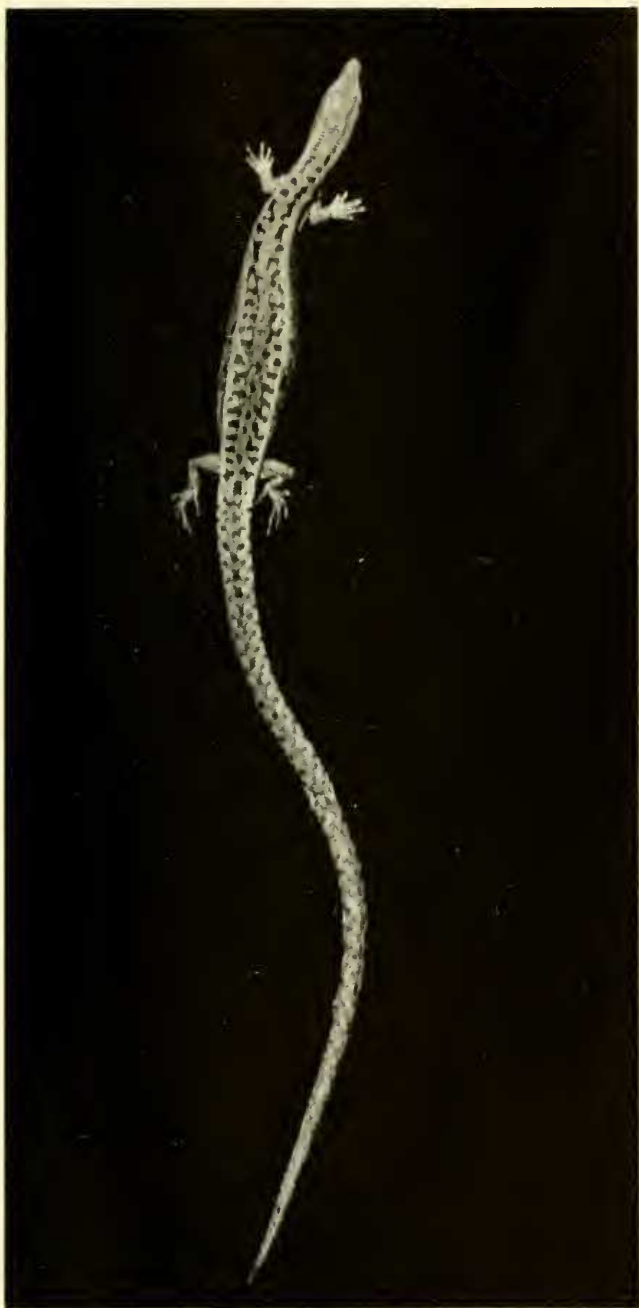


FIG. 13. *Anadia metallica arborea* subsp. nov. KUMNH No. 34225, Type. Las Flores, Tenorio, Las Cañas, Guanacaste, Costa Rica; actual length, 181 mm.

much enlarged; interparietal touches three enlarged postparietal scales; transverse series of scales following the postparietals likewise modified, larger than the nuchal series which follow behind.

Nostril in a single nasal, separated from rostral by a distance more than a third of its length, its size less than that of loreal which borders it behind; a small preocular; nostril above latter half of the first labial; four supraoculars, first very small, the series bordered laterally by five supraciliaries, a smaller second loreal (frenocular) and three small suboculars; four larger postoculars; about four series of temporals, showing much variation in size; an enlarged scale borders the auricular opening; lower eyelid well developed, with a longitudinal series of transparent scales; ear-opening nearly circular, much smaller than eye-opening.

Seven supralabials, 1,4,3,6,2,7,5 being the diminishing order of size; five infralabials, the last nearly concealed under the supralabial but bearing a brown spot; the following scale is small but likewise might be counted as the sixth infralabial, lying as it does below or under the seventh supralabial; labial border of mental equal that of the rostral; azygos postmental large; three pairs of chinshields, the first two broadly in contact, the third pair narrowly separated, narrowed almost to a point on their inner border; the second pair longer than first; three small scales lie between the posterior parts of the third pair; these followed by the first gular row consisting of nine scales, the two outer greatly enlarged and touching fourth infralabial, separated by one scale from the fifth; seventeen and two incomplete rows of gulars between third chinshields and (including) scales forming the nuchal collar; three enlarged modified pectoral scales following the nuchal collar; 37 transverse scale rows from nuchal collar to the last transverse row on abdomen; these scales square or rectangular save on breast and in last row; the preanal series consists of a small, triangular, median scale bordered laterally by two large scales that make a common suture anterior to median scale, then are separated anteriorly by another scale; these bordered laterally by a narrow elongate lateral scale and these in turn by a very small narrow scale; anterior to these is a second series of four scales.

Femoral pores 5-5, the innermost situated so that it might be regarded a preanal pore, but it is practically continuous with the femoral series; following vent there are two or three, irregular, granular series of scales; first two annuli of caudals small, the total caudal series being 108; from interparietal to back level of thigh, 62 transverse rows; the scales on side of neck, about ear and postaxil-

lary region, and about leg insertion, smaller and somewhat irregular; scales in a row about middle of body, 28. There is a tendency for the smaller axillary scales to be continued posteriorly on side for some distance. Occasionally the scale annuli are broken on back and scales tend to alternate.

Limbs slender, pentadactyl, all clawed; lamellae under palms and soles, as well as on basal portion of digits, flattened, padlike; two terminal joints of digits compressed, the lamella forming a median ridge or angle; digits more or less angular, all with strong claws; arm with large scales except on underside of upper arm; leg with large scales save on posterior part of thigh and on part of ventral surface of thigh.

Color in life: Generally light brownish olive above, the head mottled with olive; a clay-colored dorsolateral line beginning on the head passes over eyes, along neck and side of body; dorsum brownish olive above with two irregular series of black spots from occiput to tail, even continued some distance on tail but growing more indefinite on latter half; some scattered dots between the rows; a dark-edged brown stripe beginning on snout passes along side of head, becoming less distinct on side of body and tail; on this are a few small white flecks with darker borders, especially in axillary region, and an indefinite row of dark spots; a cream-white line from tip of snout covers the labials and extends back, becoming continuous with the white or cream color of the chin and venter; on belly the scales have a faint scattering of brownish pigment; chin and throat pure white. Some black spots continued on to tail; on the tail the clay-colored dorsolateral stripe interdigitates with the lateral brown stripe on basal part of tail but it gradually merges in the more uniform brownish color; a row of somewhat quadrangular light spots along ventrolateral part of tail; limbs tan with numerous, more or less distinct, small brownish spots.

Measurements in mm. and scale data of KUMNH No. 34225: Sex, ♂, snout to vent, 63; snout to arm insertion, 20; axilla to groin, 39; tail, 118; total length, 181; arm, 12; leg, 15; femoral pores, 5-5; scales around body, 28; scales from parietals to back level of thigh, 63; scale-rows from chinshields to front subcaudals, 108; scales from nuchal collar to front level of thigh, 37.

Remarks: This specimen was discovered on a tree bole some eight feet from the ground by John Baker. Despite its short, rather weak limbs it ran with dexterity but I finally managed to capture the specimen by driving it down with a long pole until it was within reach.

Leposoma southi orientalis * subsp. nov.

Leposoma southi Ruthven and Gaige (*part.*), Papers Mus. Zool., Univ. Michigan, no. 147, 1924, p. 1-3 (specimen from Museum of Comparative Zoology, Harvard College, from Suretka on the Sixaola River, Costa Rica, that "corresponds fairly well with *L. southi* with the exception of the chin shields"). *Leposoma dispar* Burt and Burt (*part.*), Bull. Amer. Mus. Nat. Hist., vol. 61, art. 7, 1931, pp. 347-349 (two specimens, MCZ Nos. 18916-17). *Leposoma southi* Ruibal (*part.*), Bull. Mus. Comp. Zool. Harvard Col., vol. 106, no. 11, June 1952, pp. 484-485 (at least Suretka specimens, MCZ Nos. 18916-17).

Type: KUMNH No. 36124 ♂, from Volio, Limón Province, Costa Rica; Edward H. Taylor, collector, June 24, 1954.

Paratype: No. 36125 ♀, taken with the type, same place and date.

Diagnosis: A small species, maximum known snout-to-vent length, 36.5 mm.; preanal pores, 2-2; femoral pores, 4-4. Differs from *Leposoma southi southi* in having gular scales larger and in fewer (two to four) rows; two pairs of chinshields, both in contact; third chinshield replaced in this form by two scales of equal or unequal size and the two followed by three somewhat enlarged scales; body more slender with five, rather than seven, dorsal scale rows. Scales around body, 19 to 21; transverse rows on venter from breast to preanal scales, 18-20; transverse dorsal scale rows from occiput to back level of thighs 29-30; eye smaller and ear longer; eye disc divided into four or five scales rather than two; dorsolateral stripe very indistinct if present.

Color: The head is a dark brownish-black save that each of the labials has a dark spot except the sixth which is uniformly dark. The dorsal surface is brownish tan with some scattered pigment except on the anterior part of a dorsolateral scale-row which may lack pigment entirely. The sides are more heavily pigmented forming a dark stripe from neck to tail. On the ventral surface the chin is cream white, the venter and base of the tail being somewhat pinkish.

Measurements and scale data on type and paratype: Nos. 36124 ♂, 36125 ♀: snout to vent, 36, 36.5; snout to arm insertion, 13.8, 13; tail, 41, † 61; total length, 77, 97.5; arm, 11.8, 9.5; leg 13, 13.2; axilla to groin, 18, 18.2; supralabials, 6-6, 6-6; infralabials 5-5, 5-5; scales around body, 19, 20; occiput to back level of thigh, 31, 30; subcaudals,—, 66; scales on eye disc 4-4, 3-4; femoral pores 4-4, 0-0; preanal pores, 2-2, 1-1.

* Latin, *orientalis* = of the East.

† Regenerated.

GENUS LEPIDOPHYMA A. Duméril

Lepidophyma A. Duméril, in Duméril and Duméril, Catalogue méthodique de la collection des reptiles (Paris Museum), 1851, pp. 137-138 (type of genus, *Lepidophyma flavimaculatus* A. Duméril); Cope, Proc. Acad. Nat. Sci. Philadelphia, 1883, p. 30.

Poriodogaster A. Smith, in Gray, Proc. Zool. Soc. London, 1863, p. 154 (type of genus *Poriodogaster grayii* Smith).

Akleistops Müller, Verh. naturf. Ges. Basel, vol. 6, 1878, p. 390 (type of genus, *Akleistops guatemalensis* Müller).

Description of genus: Body and tail rather rounded; head widened posteriorly; eye without distinct eyelids; no teeth on palate; scales of head thin, smooth except for minute tubercular rugosities; nostril surrounded by three scales. Frontal very large, divided mesially; no supraoculars present; a row of small superciliaries; lower labials and chinshields completely fused, the labials having the general appearance of chinshields; anterior nasals forming a median suture; frontonasal, frontoparietals, interparietal (bearing an eyespot), and parietals present; three enlarged temporals. Body covered on sides and back with granules intermixed with transverse (vertical) rows of larger conical or trihedral tubercles; a pair of longitudinal tubercular rows dorsally; tail segments covered with transverse rows of complete or partial annuli; venter with quadrangular scales in transverse and longitudinal rows; throat covered with equal granules; a nuchal fold; usually a longitudinal fold on side of neck from behind ear, and a pair of folds on neck.

The genus has entered Costa Rica from the north along both coasts and has extended itself at least to the Canal Zone in Panamá. The literature references of the genus in lower Central America are few. In some cases the southern specimens have been referred to *Lepidophyma flavimaculatum* A. Duméril. The following have been reported: one from Honduras (Werner 1896); one from Nicaragua (Río Mico, Caribbean drainage, Gage, Hartweg and Stuart 1937); none reported from Costa Rica; one from Panamá (referred to *Poriodogaster grayii* Peters 1874); one from Río Chilibrillo, Panamá and one from Barro Colorado I., Canal Zone (Barbour 1924, described as *L. f. obscurum*).

On the whole, the genus is a conservative one and for the most part general body form and general characteristics remain the same throughout. However, certain characters are affected by evolution, producing differences worthy of nomenclatorial recognition. At the same time other, perhaps major characters may be variable within specialized populations.

One of the difficulties in studying the genus in Central America

is that only in a few cases are adequate museum series available from any locality.

The specimens from Costa Rica in my collection number 58, of which 19 are from six localities in the Caribbean drainage; while 39 are from five localities in the Pacific drainage area.

The Costa Rican specimens are regarded as belonging to three forms, two presumably confined to the western, Pacific drainage, and one to the eastern, Caribbean drainage. They are lowland forms, none having been found above an elevation of 3,000 feet. It is doubtful that any of the forms are completely isolated geographically. Two of them occur together at Tilarán, Guanacaste.

Whether these forms are species may be questioned. I here regard them as species, aware that future study may bring evidence to the contrary.

Mertens (1952) has recently reported *Lepidophyma smithi smithi* Bocourt from El Salvador. While he does not describe the conformation of the squamation in detail he does give the following significant information:

1. A median prefrontal present (one case a double scale).
2. Three scales between the whorls of larger caudal scales (four to a segment).
3. Femoral pores (1 specimen) 5-7.
4. Four dark longitudinal bands on brown ground color on which are rows of yellow flecks.
5. Chin region of all with darker markings.

Mertens had four examples, the largest having a snout-vent length of 66 millimeters, the tail 101 mm.; two smaller specimens were 39-42 mm.; and 59-61 mm. respectively.

It will be apparent that the species found in El Salvador differs markedly from the two found in the Pacific drainage of Costa Rica.

KEY TO THE COSTA RICAN SPECIES OF LEPIDOPHYMA

1. Throat region behind chinshields strongly marked with dark brown or black reticulations enclosing rounded cream spots. Second pair of chinshields separated by small scales; postocular scales wider. First loreal higher than second nasal; no trace of lateral stripe; 14-17 femoral pores; Pacific drainage,

Lepidophyma reticulatum sp. nov.

Throat region behind chinshields lacking definite reticulations, the area usually light with nearly equal distribution of pigment, or a few light brown dots; second pair of labials forming a median suture; anterior loreal lower or higher than posterior nasal; postocular scales narrower.....2

2. Femoral pores 13-15; a pair of postparietals or partial sutures marking the same; first loreal higher than the posterior nasal. Caribbean drainage..... *Lepidophyma anomalum* sp. nov.
Femoral pores 16-18; no trace of postparietals or partial sutures marking same. Five transverse complete or partial caudal annuli dorsally on each segment of tail; posterior nasal higher than first loreal, which is separated from frontonasal. Pacific drainage,
Lepidophyma ophiophthalmum sp. nov.

The literature on the genus, especially as it applies to Central America, is scattered. I include the following series of bibliographic references for the recognized forms, *flavimaculatum flavimaculatum*, *f. obscurum*, *smithii smithii*, and the doubtful *grayii*. I cannot vouch for the correctness of the synonymy since it is possible that some of the reports have been confused.

Lepidophyma flavimaculatum A. Duméril

Lepidophyma flavimaculatus A. Duméril, in Duméril and Duméril Catalogue methodique de la collection des reptiles (Paris Museum), 1851, pp. 138-139 (type locality: restricted locality, Río de la Pasión); A. Duméril, Rev. Mag. Zool., 1852, p. 409, pl. 17; Sumichrast, Arch. Sci. Phys. Math., Mar. 1873, p. 251.

Lepidophyma spec. Müller, Verh. naturf. Ges. Basel, vol. 6, 1878, p. 627 (Verapaz, Guatemala).

Lepidophyma flavomaculatum Bocourt, Mission Scientifique au Mexique et dans l'Amérique Centrale; Études sur les Reptiles, livr. 5, 1878, pp. 306-309, pl. 20 F, figs. 2, a-g (also spelled *flavimaculatum* on page facing plate); Boulenger (*part.*), Catalogue of the lizards in the British Museum (Natural History), 2nd Ed. vol. 2, 1885, pp. 326-327 (Tehuantepec, Mex.); Werner, Verh. zool-bot. Ges. Wien, Jahr 1896, p. 4 (Honduras) p. 9 (Guatemala); Abh. Wiss., Band 22, Abt. 2, p. 345; Barbour, Proc. New England Zool. Club, vol. 9, Jan. 24, 1924, p. 9 (southeastern part of Mexico, Yucatán and the Caribbean coastal plain of Guatemala, British Honduras and Nicaragua [M.C.Z.]); Stuart, Copeia 1937, no. 1, Apr. 10, p. 69 (along Río de la Pasión near Petén-Alta Verapaz border [exact locality unknown]); Misc. Publ. Mus. Zool. Univ. Michigan, No. 69, June 12, 1948, p. 55 (El Petén, 3 spec.); Cont. Lab. Vert. Biol. Univ. Michigan, no. 45, May 1950, pp. 23, 56 (below 900 m.).

Lepidophyma smithii smithii Bocourt

Lepidophyma smithii Bocourt, Journ. Zool., Paris, 1876, vol. 5, p. 403 (type locality: restricted locality, Mazatenango, Guatemala); Mission Scientifique au Mexique et dans l'Amérique Centrale, Étude sur les reptiles, livr. 6, 1878, pp. 309-312, pl. 20 F, fig. 3, a-b; pl. G, figs. 2, a-b; Müller, Verh. naturf. Ges. Basel, vol. 6, 1878, p. 627 (Mazatenango, Guatemala); Barbour, Proc. New England Zool. Club, vol. 9, Jan. 24, 1924, pp. 9-10 (Pacific coastal plain of southwestern Mexico and Guatemala).

Akilestrops guatemalensis Müller, Nat. Ges. Basel, vol. 6, 1878, pp. 390-398, pl. 1; pl. 2, figs. 1-5 (type locality: "Mazatenango, coste grande de Guatemala").

Lepidophyma maculatum (*part.*) Boulenger, Catalogue of the Lizards in the British Museum, 2nd Ed., vol. 2, 1885, pp. 326-327.

Lepidophyma smithii smithii Smith, Proc. U. S. Nat. Mus., vol. 92, no. 3153, 1942, p. 380; Smith and Taylor, U. S. Nat. Mus. Bull. 199, 1950, p. 152; Mertens, Abh. Senckb. Naturf. Ges., No. 487, 1952, p. 53, pl. 11, fig. 61 (San Salvador).

Lepidophyma grayii (A. Smith)

Poriodogaster grayii A. Smith, in Gray, Proc. Zool. Soc. London, 1863, p. 154, pl. 21 (unknown locality); Peters, Proc. Zool. Soc. London, 1874, p. 307. (Specimen from Panamá thought to be identical with this species, suggesting Panamá as the type locality. Bocourt states that this specimen has 17 femoral pores on each side).

Lepidophyma flavimaculatum obscurum (Barbour)

Lepidophyma flavomaculatum obscurum Barbour, Proc. New England Zool. Club, vol. 9, Jan. 4, 1924, pp. 9-10 (type locality, Río Chilibrillo, Panamá; known also from Barro Colorado Island, Canal Zone).

Barbour has based his form on two specimens from Panamá (Río Chilibrillo, and Barro Colorado Island, Canal Zone). His description is extremely brief consisting only of the following: "In squamation very similar to *L. f. flavomaculatum*. It differs in having relatively a slightly smaller and narrower head; in having the longitudinal rows of enlarged dorsal scales more straight, more even, and more closely and regularly beset with longer spine-like scales. The color is blackish brown, and the yellow rosette-like spots are only about one half of the size, each, of those in the northern subspecies, of which apparently it is an offshoot, typically colored for the humid forest, as the other is for a more xerophilous life." Whether this is identical with Peters' specimen (see above) can only be determined when the two specimens are compared and these in turn compared with the type of *Poriodogaster grayii*.

I have examined one Panamanian specimen identified as *L. flavimaculatum obscurum* (USNM 65809). In this there were no lateral light spots on the back and sides of body but some at base of tail. There are five labials preceding the subocular labial that have small cream spots. The venter is uniform dark brown. The tail is broken and a single segment remains, so that the character of the caudal squamation cannot be ascertained. The femoral pores are 13-14 (female). The preanals consist of a posterior pair bordered laterally by several tiny scales. The pair preceding these is smaller and longer than wide and preceded by two small regular pairs. The medial prefrontal is large, about half the area of the outer prefrontal. There is no trace of postparietals.

This specimen measures 103 mm. snout to vent; snout to arm, 39.5 mm.; axilla to groin, 48 mm.; arm, 30 mm.; leg, 41 mm.; width of head, 17 mm.; length of head, 25 mm.

Lepidophyma reticulatum * sp. nov.

(Fig. 14)

Type: KUMNH No. 36245 ♀, Agua Buena, Puntarenas Province, Costa Rica, July 25, 1954; Edward H. Taylor collector.

Paratypes: Nos. 36238-36244, 36246-36249, topotypes, same date and collector; Nos. 34189-34193, 3 km. E San Isidro del General, San José Province; Nos. 34194-34202, 34204, 15-17 km. WSW San Isidro del General, Puntarenas Province; Nos. 36230-36237, 4-5 km. NE Tilarán, Guanacaste.

Diagnosis: Large species with approximately 38 caudal segments, each, except first, with five rows of partial or complete scale annuli crossing dorsal surface of tail (rarely six), the terminal segments not clearly marked; a median prefrontal absent (or present in some specimens in the San Isidro del General region); no trace of post-parietals; femoral pores in both sexes, 14-17 (average 15.4); the first loreal higher than posterior nasal and touching frontoparietal; only first pair of chinshields in contact behind mental. Throat strongly reticulated with dark blackish-brown enclosing cream spots; scales with small glandular pores.

Description of type: Head nearly triangular seen from above; snout rather pointed, the rostral wider than high, narrowly visible above; anterior nasals broader than high, forming a median suture; frontonasal eight-sided, broader than long; two prefrontals, their outer edges bent down over canthus rostralis, smaller than the divided frontals; outer edges of frontal separated from orbit by a small row of supraciliaries; no supraoculars; interparietal slightly wider anteriorly than posteriorly, pushing in between posterior part of frontal scales, separating broad frontoparietals completely, and touching both parietals; latter longer than wide bordered laterally by two temporals the anterior of which is more than triple size of posterior; nostril surrounded by three scales: first labial, anterior and posterior nasals; first loreal higher than nasals, its length about one third the length of the second loreal which is nearly as high; two presuboculars and a very narrow linelike preocular; five supraciliaries; five postoculars; two minute suboculars separate fifth supralabial from the orbit; first upper temporal twice as wide as postoculars, lower small; between sixth and seventh labials and second upper temporal two rows of small temporal scales; seven supralabials (eighth scale very small); the seventh and eighth scales

* Latin, *reticulatus* = reticulated, netlike.

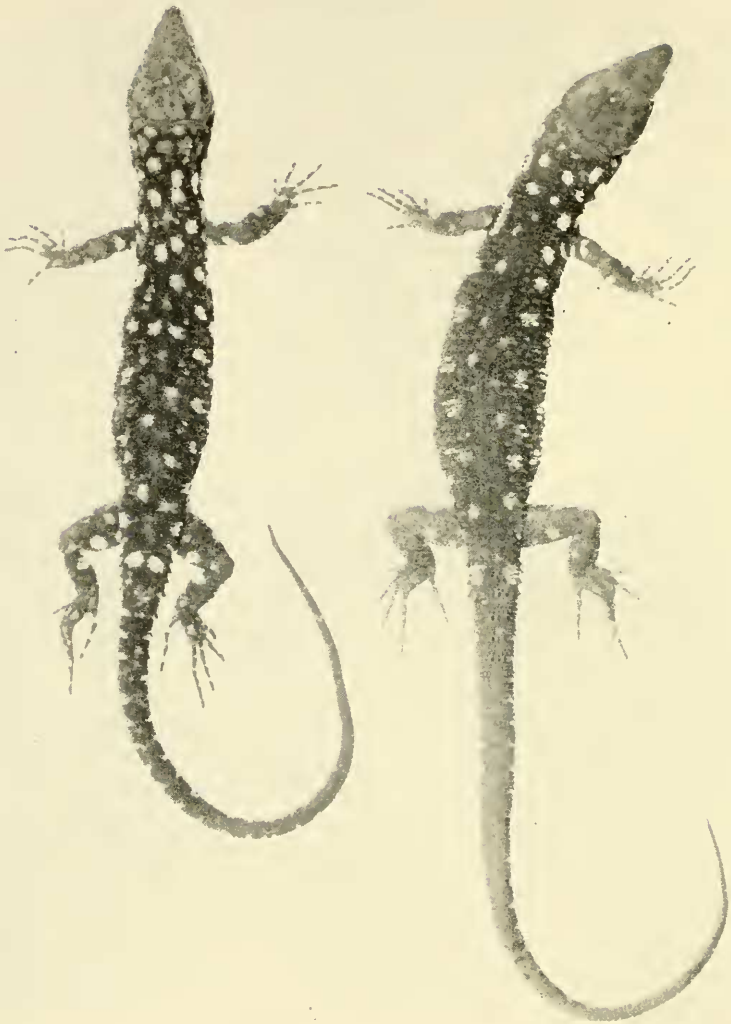


FIG. 14. Inner figure, *Lepidophyma reticulatum* sp. nov. Paratype, KUMNH No. 34194 ♀. 10 mi. SW, San Isidro del General. Outer figure, *Lepidophyma anomalum* sp. nov. KUMNH No. 34207 ♀. Type. Actual length 233 mm.

separated from mouth by granules; a row of somewhat larger tubercles border edge of ear opening, and these preceded by two or three still larger moundlike scales; infralabials (fused labials and chinshields) four, only the first pair in contact; second pair largest, narrowly separated mesially; fourth about one-fifth times as large as

third; posterior part of lower lip bordered by several granules; mental large, its labial border three times that of rostral border; on throat and sides of neck, conical granules; ear-opening large, its greatest diameter approximately 4 mm.; vertical diameter of orbit, 3 mm.; length of eye to tip of snout, 7.5 mm.; distance from orbit to ear-opening 8 mm.; a pair of ventral longitudinal folds on neck; a pair of short lateral folds running back from ear; a transverse nuchal fold.

Body covered with small conical or moundlike granules intermixed with larger conical, trihedral or irregularly shaped tubercles that tend to form vertical rows on sides of body; a pair of longitudinal rows on dorsum separated from each other by four or five rows of granules; tail segments marked by series of annular rings of scales increasing in size posteriorly; the first two definite segments with large tubercular whorls, and these separated by two small granular rows; first typical segment with five partial or complete annular scale rings, the scales growing larger towards the ventral part so that the median ventral part of each segment has only three scales; tip of tail regenerated in type. Scales on limbs varied in size, the hind leg especially with numerous larger tubercles; palm and sole with somewhat conical granules; digits with varied ventral scales, those on proximal regions conical or trihedral; in medial parts digital lamellae divided unequally, distally they are complete (or an occasional one divided).

Scales on breast flat, subimbricate, becoming elevated laterally; venter with flat juxtaposed scales arranged in eight longitudinal rows with an addition of a partial lateral row of more elevated scales on each side; about thirty transverse rows from axillary level to the inguinal level.

Scales on under side of thigh somewhat subimbricate anteriorly; femoral pores 17-15; two pairs of larger (slightly irregular) preanal scales preceded by a very small pair.

Color in life: Head brown with some indefinite dark marks tending to form a somewhat symmetrical (somewhat radiating) pattern. Supralabials with cream marks on sutures; infralabials each with a large black spot or diagonal bar separated by cream; throat strongly reticulated with brownish black enclosing cream spots. On side of head and neck rounded cream spots surrounded by black; body black on back and sides with six longitudinal series of irregular cream spots; arms and legs with a few conspicuous spots. A pair of larger cream spots on tail above vent; segments of tail with a series of vertical cream lines chiefly on the largest tubercular scale

series; median part of dorsal surface black; ventral surface with cream predominating anteriorly and black posteriorly; femoral pores and adjoining scales cream; venter dirty cream with some dark flecks along ventrolateral region; fingers and toes ringed with cream; anal scales bluish white.

Measurements in mm.: Snout to vent, 92; tail, 120; length of head, 20; width of head, 16.2; snout to arm, 33; axilla to groin, 45; arm, 30; leg, 41.

Variation: The topotypic specimens agree closely with the type in most characters. There is no trace of the median prefrontal; the first loreal has the same relation to the posterior loreal and the posterior part of the nasal, and the femoral pores average approximately 16 on each side. Two have the preanal scales irregular. The scale rows on the dorsal part of the tail segments are five, but in two specimens six may appear on one or two segments. The total number of segments is approximately 38, however, on the posterior part of the tail the segments are not well differentiated.

The specimens that occur at San Isidro del General differed most in that a median prefrontal was present in those from near the town, while in those from a somewhat lower elevation, at a locality 15-17 kilometers west-southwest of the town, five have the prefrontal present, four have the scale partially segmented. Two of these specimens have six annular rings on several segments of the tail.

Those taken still farther north at Tilarán lack all trace of the median prefrontal. The head markings are very indefinite. One specimen has a bifid tail, where it has been regenerated. There are other smaller, less significant characters that can be used to separate these various groups of specimens. In all, the throat maintains the heavy reticulation, the postocular series is enlarged, and the anterior temporal is proportionally small.

Lepidophyma anomalum * sp. nov.

(Fig. 14)

Type: KUMNH No. 34207 ♀, Los Diamantes, Guápiles, Limón Province, Costa Rica; Sept. 3, 1947; Edward H. Taylor and Richard C. Taylor, collectors.

Paratypes: KUMNH Nos. 34205-34206, 34213, topotypes, same date and collectors; No. 34210, Bataan, Limón Province; Nos. 34211-34212, 34214-34216 La Lola, Limón Province, Nos. 36256-36257, Puerto Viejo, Limón Province; No. 34208, Morehouse Finca, Turri-

* Greek, *anomalos* = abnormal.

alba, Cartago Province; Nos. 36251-36255, Suretka, Limón Province; No. 34209, Costa Rica (uncertain provenance).

Diagnosis: A large species, with approximately 35 caudal segments, the basal seven to twelve with four complete or partial scale annuli, dorsally; the following segments with five annuli; terminal three or four segments not clearly differentiated; a median prefrontal normally present; first two pairs of infralabials in contact behind mental; femoral pores in males and females 13-15 (average about 14); throat cream with a few tiny, scattered, brown dots the size of the scales between neck folds, but no reticulation of black or brown and no cream spots; usually a pair of postparietals completely or partially segmented from parietals; body and caudal scales each with a small glandular pore. Two dorsal rows of spots, light tan; lateral spots cream.

Description of type: Head, seen from above, subtriangular, pointed anteriorly, the border of the head plates tending to be slightly angular posteriorly on the occiput, and with a slight median longitudinal depression in the parietal region; rostral wider than high, angular medially; anterior nasals form a median suture about two thirds the greatest width of the scale; frontonasal eight-sided, and distinctly wider than long, touching first loreal; three prefrontals, the median little more than one-third times the area of the outer scales; frontal divided mesially, separated from orbit by superciliaries, angular posteriorly; interparietal bearing an eye-spot, subhexagonal, only slightly wider anteriorly, somewhat narrowed near the middle, separating completely the frontoparietals; latter scales with their long axis diagonal, touching one supraciliary, one postocular and two temporals; parietals distinctly longer than wide; postparietals only partially indicated by a pair of grooves directed diagonally backward from the sutures with the interparietal; second nasal much higher than first, much higher than long (wide), not as high as second loreal, not separating it from frontonasal; first loreal as high as second but only half its length (width); a slender linelike preocular four times as high as wide; one pre-subocular; four narrow postoculars and five small supraciliaries; first temporal much wider (four times) than adjoining postoculars; second temporal large, about five times area of first temporal, about four times area of second; eight supralabials, first high forming with the nasals the border of nostril, fifth below eye and separated from the orbit by a linelike scale, sixth largest, touching two or three postoculars, but separated from the first and second temporals by

one or two rows of granular temporals, last labial very small; three anterior infralabials (fused labials and chinshields) large, both forming median sutures, the second pair partially separated on the median line; last two small with two differentiated scales bordering them; mental large, angular posteriorly; a small anomalous triangular scale (true infralabial?) lying between the mental and first large infralabial on each side; auricular opening large, with a row of about seven larger tubercles along its outer border, its height four millimeters; orbit of eye circular; no evidence of eyelids; orbital diameter three fourths the height of ear-opening; distance between orbit and tip of snout (7 mm.) less than distance between orbit and ear; a pair of longitudinal folds along outer ventral surface of neck; lateral fold from ear to shoulder, and a transverse nuchal fold; body and sides covered with small, conical or moundlike granules, intermixed with larger, conical, trihedral, or pyramidal tubercles, the latter forming vertical, transverse rows laterally; a pair of longitudinal rows of tubercles on back, separated by five rows of subequal granules; chin (partly) and throat covered with subequal granules; breast and venter covered with flat, juxtaposed, quadrangular scales, forming ten longitudinal rows, and between axilla to groin levels, about 27 transverse rows; scales on breast smaller, somewhat irregular; tail with each segment bearing posteriorly a whorl of larger tubercles; on first basal segment the large whorls are separated by two, on second by four smaller whorls, while the following six segments have them separated by three complete or partial whorls; from here on they are separated by four whorls. Thus each segment has either four or five complete or partial whorls dorsally; but ventrally, where the scales are larger, there are two or three only.

Arms and legs covered with granular scales, with some intermixed tubercular scales, especially on upper parts of hind leg; those on arm semispinose; some much enlarged scales on outer ventral surface of tibia; subdigital scales may be granular near base, the lamellae tending to be unequally divided except on the distal half. Female with fifteen pore-scales, most of which are pierced, and the three or four proximal and four or five distal ones show larger, perhaps functional pores. First preanal scales large, longer than wide, with a small scale on each side, and preceded by a second pair; these in turn preceded by a row of four scales.

Color in life: Dorsal part of head brown, with evidence of some darker marking, the area above eye distinctly darker; body black

dorsally and laterally, with six rows of spots, those on the dorsal surface somewhat indistinct, tan in color; lateral rows of spots brownish cream; tail blackish brown with very narrow vertical cream lines marking tubercular whorls on sides of tail; a vertical cream line in front of eye; cream dots on supralabials between black spots; infralabials with black spots or bars separated by brownish cream (fawn); chin dirty white, with a few fine brown flecks; cream spots present on cheeks and on sides of neck; the periphery of the ventral scales with much brownish pigment leaving the central part of scales lighter; preanal scales bluish white; subcaudal scales brown, mixed with cream; femoral pore-scales cream; arm and leg blackish brown with some cream spots.

Variation: The femoral pores are smaller in this species and the number is somewhat reduced varying between 12-15 (one specimen has 16 on one side). Four of the specimens (the type, and Nos. 34208, 34215, 34216) have small intercalary "labials" following the mental on the border of mouth. In the last three specimens and No. 36257 there is a small scale segmented from the outer anterior part of the parietals on one or both sides; only two specimens have the median interparietal completely missing; two specimens have five labials anterior to the subocular but this is a case of the second or the fourth labial being segmented. Two specimens have the large temporal segmented into two unequal scales, the segmented section being the outermost part. The most striking variable character is the development of a pair of scales (postparietals) segmented from the inner parts of the parietals behind the interparietal. Eight of the specimens (6 of them from Bataan and La Lola) have the pair complete or practically so; six others show partial suturing of

Table of Measurements of *Lepidophyma anomalum* sp. nov.

Number	Snout-vent	Tail	Axilla to groin	Arm	Leg
36257.....	104	132*	31	42	49
34207.....	96	137	29	40	47
36254.....	84	117	29	39.5	39
34211.....	81	*	27	38	36
36255.....	71	*	22	30	31
36253.....	67	*	22	30	30
34208.....	62	86	21	26	28
34205.....	44	62	16	19	19.5
34206.....	42.5	*	14.5	18	18.2
36256.....	42	*	15	21	23
36252.....	41	53	13.2	18	18
36251.....	41	53	13	18	18
34213.....	38	50	12.2	17	16.2
34215.....	38	47	12	17	16
34212.....	35	*	12	16	16

* Tail regenerated or partly missing.

the scales while five from Suretka, Los Diamantes, and Puerto Viejo have no trace of this character. It was noted that in three tiny specimens from La Lola the loreal was not higher than the posterior nasal and in one case the posterior nasal excluded the first loreal from the frontonasal. Two specimens showed some variation in the character of the anal scales by having a partial row of small scales separating first and second pairs. In the younger specimens the basal subcaudals seem to be slightly keeled. In one, there were two presuboculars. The pores in the body and caudal scales are small; those on the venter can be distinguished only with difficulty.

*Lepidophyma ophiophthalmum** sp. nov.

(Fig. 15)

Type: KUMNH No. 36250; 5 km. NNE Tilarán, Guanacaste, Costa Rica, Aug. 16, 1954; Edward H. Taylor, coll.

Paratypes: KUMNH Nos. 34217-34219, Las Flores, Tenorio, Las Cañas, Guanacaste (near base of Volcán Tenorio), Aug. 22, Edward H. Taylor and John Baker, colls.

Diagnosis: Superficially closely resembling *Lepidophyma reticulatum* in color and marking. Median prefrontal present or absent; chin lacking reticulation, light colored save for brown dots the size of granules; posterior nasal much higher than anterior, and higher than first or second loreal; first loreal separated from frontonasal; second pair of labials forming a common suture; vertical diameter of ear-opening a half greater than diameter of orbit; frontonasal hexagonal; 35 caudal segments all with five complete or partial annular scale rings except terminal three or four where segments are ill defined and may be reduced to four annuli; parietals proportionally longer and narrower than in *reticulatum*; frontoparietal narrowed laterally where it touches the last supraciliary and upper postocular; first pair of preanal scales bordered laterally by a small preanal; a partial or complete row of small scales between first (larger) and second preanal pair; femoral pores 16-18; anterior temporal distinctly larger than in *L. reticulatum*.

Description of type: Head outline generally triangular seen from above; snout pointed; rostral wider than high, rising to a sharp angle mesially, distinctly visible seen from above; anterior nasals wider than high, their inner median height at suture little more than half of outer height at nostril; frontonasal hexagonal, slightly broader than long; two large prefrontals, their outer edges bent down over

* Serpent eye. Greek. From *ophi* snake and *ophthalm* eye.

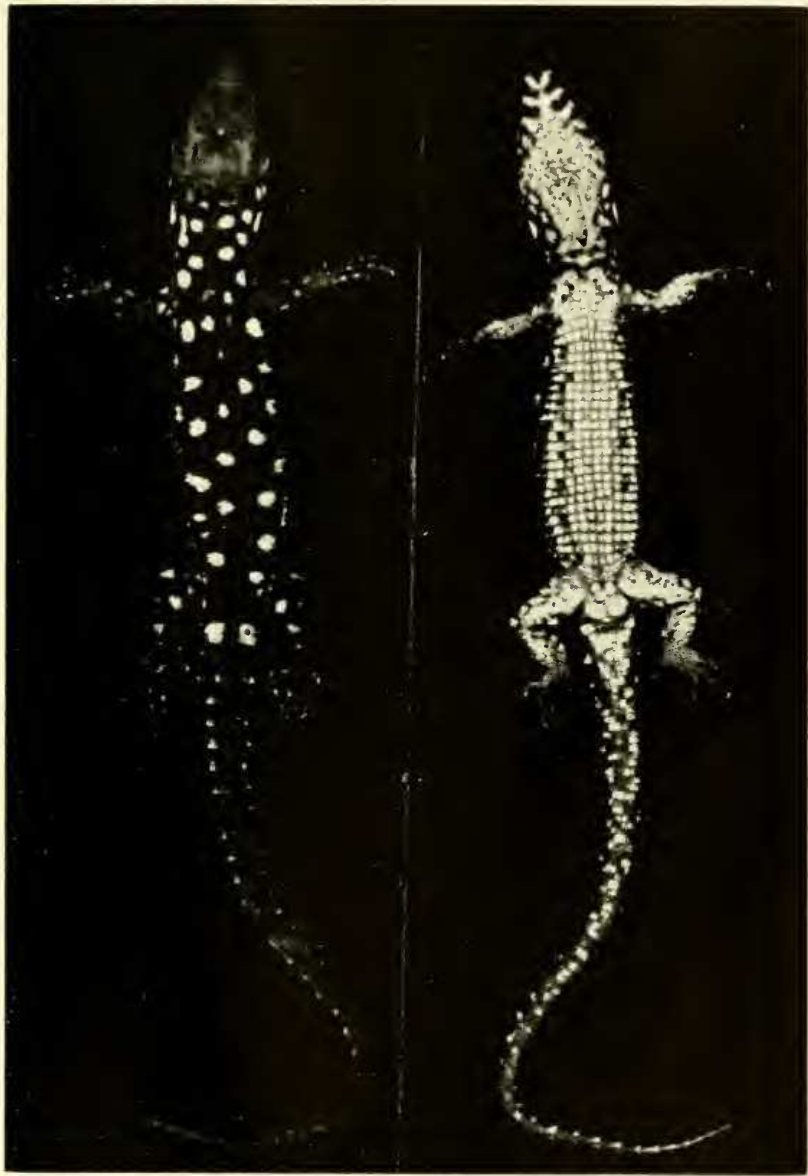


FIG. 15. *Lepidophyma ophiophthalmum* sp. nov. Type. KUMNH No. 36250, five km. NNE Tilarán, Las Cañas, Guanacaste Province, Costa Rica. Total length, 183 mm.

canthal edge, laterally touching posterior nasal, both loreals, first supraciliary and preocular; frontal large, its front borders straight, transverse, angular posteriorly, separated from orbit by a row of three or four somewhat projecting supraciliaries; frontoparietals six-sided, narrowed anteriorly; interparietal wider anteriorly, subhexagonal, separating completely the frontoparietals, with an "eye-spot" that is white with a black spot showing in its middle; parietals (6 mm. x $3\frac{1}{2}$ mm.) six-sided; first temporal relatively large (2.5 mm. x 2 mm.); second temporal very large, third, less than one-third times size of second; scales in preauricular region small, variable in size; auricular edge bordered by a row of seven heavier scales nearly hiding another smaller inner row; a pair of longitudinal skin folds on outer ventral surface of neck; a less distinct fold from behind ear to nuchal fold; a transverse nuchal fold. Eye circular without evident lids, the diameter of orbit (2.8 mm.) less than height of auricular opening (3.6 mm.); distance between tip of snout and orbit (6.5 mm.) less than distance between orbit and ear. Body covered with small conical or moundlike granules, interspersed with large conical or trihedral, spinelike tubercles forming vertical lateral rows; a pair of longitudinal rows on dorsum, separated from each other by four or five irregular rows of subequal small granules; the larger tubercular scales form continuous series around tail, one large series on posterior part of each tail segment. Nostril surrounded by three scales; posterior nasal higher than loreals or anterior nasal, widened at top, separating the first loreal from frontoparietal, touching prefrontal; anterior loreal twice as high as long, one third length (width) of second but nearly as high; a long, narrow preocular; one presubocular; three postoculars, lowest largest; fifth labial below orbit separated from it by two granular scales; sixth labial separated from first two enlarged temporals by a small lower anterior temporal and two granular rows of temporals; first (upper) temporal more than three times width of upper postoculars. Seven supralabials, first reaching up to nostril, sixth largest, nearly twice as long as high; last small, separated from edge of lip; four lower labials very large (fused labials and chinshields); two anterior pairs making mesial sutures, the second pair much larger than others; mental with a labial border double that of rostral, angular posteriorly; posterior part of the mouth opening bordered by granules. Tail segments approximately 36, each covered with five complete or partial rows of subconical scales, the posterior row composed of much larger tubercles; ventrally each segment with three, rarely

four scales, larger than the lateral or dorsal scales; arms and legs covered with small granules intermixed with larger ones, some of those on under surface of thigh subimbricate; femoral pores 16-16 in small single scales; subdigital lamellae variable, sometimes divided or broken up into small tubercular scales at base of third and fourth toes; distal lamellae usually complete; scales on venter flat, quadrangular, subequal except those on breast which are smaller, arranged in 10 longitudinal rows and 26 transverse rows from level of axilla to level of groin; on part of the transverse rows one counts 12 scales, but the outer row on each side is irregular, variable, the scales not flat. Most if not all scales on body and tail with pores or glands visible under magnification. Preanal scales consist of a posterior row of two much enlarged scales and two smaller lateral scales; median row broken leaving the third pair on left side touching a large posterior scale; third row has two scales, larger than those in median row.

Color in life: Head brownish with some indefinite darker marking; black spots on loreals and supralabials separated by small cream spots; infralabial and mental with dark bars, separated by white; chin dirty white with a few brown granules; sides of neck with large cream spots on black background; body black with six irregular rows of lighter spots; venter scales heavily dusted with brown leaving a whitish central area; outer rows of ventral scales with a nearly continuous, irregular white line; femoral pore-scales white. Arms and legs spotted white; tail with irregular white spots on sides, one to each segment, variable in size and position; under side of tail blackish with some white scales; preanals bluish white.

Measurements in mm.: Snout to vent, 77; tail, 106; head width, 13.8; head length, 18; snout to foreleg, 31; snout to ear, 18.5; axilla to groin 36; arm, 23.5; leg, 35.

Variation: The three paratypes are from a locality 20 kilometers northwest of the type locality, at Las Flores on the large cattle ranch of Tenorio, a place situated near the base of Volcán Tenorio but at about the same elevation as the type locality. The two smaller specimens have a median prefrontal which is lacking in the adult. The median row of preanals is complete in the young, broken in the adult. There are 16 to 18 femoral pores present in all.

Anomalepis dentatus Taylor

Anomalepis dentatus Taylor, Proc. New England Zool. Club, vol. 17, June 26, 1939, pp. 90-91, pl. 5, figs. 1-3 (type locality, Barro Colorado Island, Canal Zone); Taylor, Univ. Kansas Sci. Bull., vol. 34, pt. 1, Oct. 1, 1951, pp. 24-25.

A small snake of the genus *Anomalepis* taken at a point about four kilometers southeast of Los Angeles de Tilarán, Province of Guanacaste, proves to belong to this species. The specimen is 156 mm. in total length, of which 3.1 mm. represents the length of the tail.

The scale counts are as follows: Scales from rostral to tip of tail, 271. On the ventral surface from mental to vent, there are 264 scales; from vent to end of tail seven subcaudals. The longitudinal scale-rows about body are 28, 24, 22, 20. When scale-rows drop out they do so by a fusing of two scale-rows, thus forming some enlarged scales. The subsequent scales become gradually smaller. Two mandibular teeth are present, separated by a mesial diastema. The conformation of the head scales is very much the same as depicted by Taylor, *loc. cit.* save that the scales, lateral to the frontal, are slightly larger than they appear in the dorsal view of figure 3 since the scales are drawn in perspective. The preanal scales are in contact posteriorly.

No evidence whatever has been brought to bear that *dentatus* is a synonym of *Anomalepis mexicanus*. The differences as portrayed in the characteristics of the large head scales, especially their proportions, is strong evidence to the contrary.

Leptotyphlops ater * Taylor

Leptotyphlops ater Taylor, Univ. Kansas Sci. Bull., vol. 26, no. 15, Nov. 15, 1940, pp. 536-538, fig. 4 (type locality, Managua, Nicaragua).

A Costa Rican specimen of this species was taken at Bagaces at a point where one of the streets enters the Pan-American Highway. It was in loose earth below a flat rock. It is presumably a juvenile specimen, its total length being 76 millimeters, of which five are in the tail. The tail turns down and ends in a rather sharp spine.

The dorsal and lateral surfaces are dark blackish but when submerged in a clear liquid it shows a very faint suggestion of darker medial areas on the scalerows. This probably is not an adult condition since the type displays no trace of such markings. This specimen differs but little from the type in the characters of the squama-

* Taylor *l. c.* p. 540, couplet 22 states: "only spine on tail cream"; and "tail in tail length, 14"; This should read, cream spot on tail including about four transverse scale rows; (as stated on p. 533) and, tail in tail length 16. Dunn and Saxe 1950 point out this error.

tion. The conformation of the head scutes is practically identical with that shown in the figure of the type—the nasal is completely divided, a supraocular bears the same relation to the rostral and anterior (superior) nasal, the labials, parietals, frontal and interparietals likewise, are practically identical proportionately. The eye is scarcely discernible in the ocular. The last labial and the ocular have their lower parts whitish and the infralabials are light. The anterior part of the snout is dark gray. The anterior part of the venter is grayish white, growing darker posteriorly.

There are 14 scale-rows about body and 10 about tail and approximately 245 transverse scale-rows from the rostral to the tip of the tail. There are 19 subcaudals. The anal is a large single scale preceded by a narrow, transversely widened scute, at least as wide as the anal.

The width of the head is 1.6 mm. and of the body 1.7 mm.*

The ratio of tail length to total length is 15; the ratio of the width of the body to the total length is 47.5. In the type these two ratios are 18.9 and 60 respectively. The scales from lip to vent number 225. It will be necessary to verify the number of scales in the type as the statement "259 scales from snout to vent" is probably intended for "snout to tip of tail." Even if this were true the present specimen has fewer transverse scale rows on the body than the type.

This species is not a member of the *albifrons* group.

Conophis lineatus nevermanni Dunn

(Fig. 16)

Conophis nevermanni Dunn, Copeia 1937, no. 4, pp. 214-215 (type locality, Río Poás de Aserri [near San José] Costa Rica); Taylor, Univ. Kansas Sci. Bull., vol. 34, pt. 1, Oct. 1, 1951, p. 145; Savage, Trans. Kansas Acad. Sci., vol. 52, no. 4, 1949, pp. 484.

A specimen of this species, KUMNH No. 35630, taken from under a stone in an open meadow, two miles south of Hotel Yomale, some 32 kilometers north of Barranca, Puntarenas Province, but in, or near, the boundary of Guanacaste Province, is referred to this species with some hesitancy. The markings and scale characters of the specimen follow:

The venter is ivory to yellow ivory with a row of black dots on the lateral part of ventrals throughout the length of the body. A black line running through the middle of the first (outer) scale-row

* The width of the body in the type is given as 305 millimeters, an obvious typographical error for 3.05.

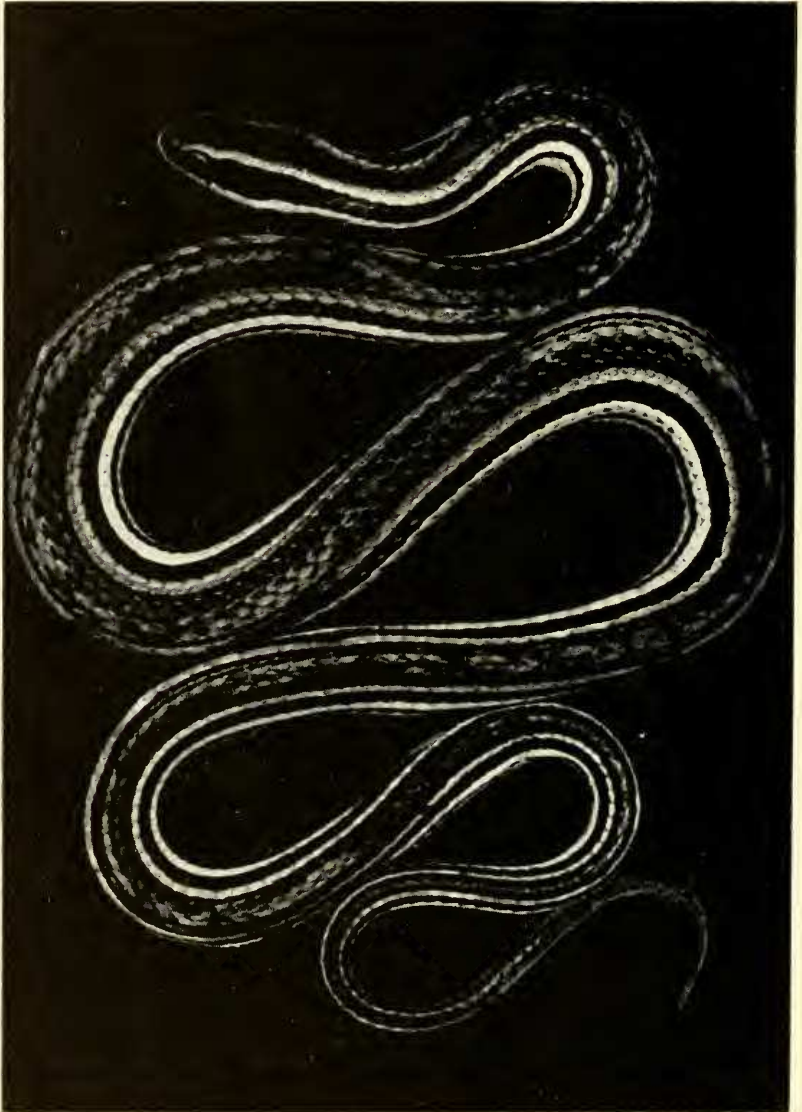


FIG. 16. *Conophis lineatus nevermanni* Dunn. KUMNH No. 35630; about 32 km. N Barranca, near the boundary of Guanacaste and Puntarenas Provinces, Costa Rica.

is continued a little past the base of the tail. Above this, an ivory line covering one whole scale-row and the edges of adjoining scale-rows runs from the tip of the snout along the body and onto the tail bearing a series of black dots along the latter half of the body and

posteriorly is lost in the ventrolateral color of tail. The broad black band, beginning on the tip of the snout runs along the neck where it covers about four scales, then narrows, occupying all except the outermost edges of the third and fourth rows. A lighter streak is present in the middle of this stripe, evident only for a part of its length. Above this is an olive-gray stripe on the fifth and sixth rows, becoming lighter cream or ivory posteriorly, and throughout it is lighter on the lower part of the fifth row. This is bordered above by a narrow black line not more than one scale wide, on the seventh row anteriorly, on the sixth posteriorly. The five rows (four posteriorly) lying between the seventh row and its fellow of the opposite side are blackish on the back of the head and neck, but become olive-gray more posteriorly. The color is not uniform. The median dorsal row has a line of dashlike black marks, and a row of darker flecks occur on the edges of the eighth and ninth rows of each side. The upper part of the supralabials have a cream or ivory line with a ragged lower edge while the lower part of the labials show pigmented areas of black, the color not solid. The infralabials, chin, and part of throat pigmented with brown, enclosing two short rows of rounded ivory spots.

The following scale characteristics obtain: ventrals 169, subcaudals 70, anals 2, supralabials 8, the fourth and fifth enter orbit; infralabials 9, preocular 1, postoculars 2, anterior temporals 2, scale rows, 21-19-19-17.

This form definitely is not *Conophis lineatus dunni* Smith from Nicaragua and it is possible that it is not identical with Dunn's *nevermanni*. The later is very briefly described and the type is said to be in Dunn's private collection.

Leptodeira sp.

Hypsiglena torquata torquata Taylor, Univ. Kansas Sci. Bull., vol. 36, pt. 2, no. 11, July 15, 1954, p. 712-713, fig. 9.

In the above listed publication I reported and figured a juvenile snake as a species of *Hypsiglena*. The specimen had been badly injured, the head having been subjected to extensive injury in the palatal and dental regions. After the publication I was struck by the large number of subcaudals, a character which should have caused me to question the association with *Hypsiglena* from the first. After careful re-examination of the specimen, a fragment of the posterior mandible was found showing the base of a broken, enlarged, posterior, grooved tooth. This fact, together with the scale characters and the high subcaudal count, places the specimen in the genus *Leptodeira*, as now understood.

I think it unwise to attempt to allocate the form specifically owing to its mutilated condition and the fading of the colors and markings. New material should be at hand before this is undertaken.

Coniophanes piceivittis piceivittis Cope

(Fig. 17)

Coniophanes piceivittis Cope, Proc. Amer. Philos. Soc., vol. 11, July 1869, pp. 149-150 (type locality, Chihuitán, Oaxaca, Mexico); Bailey, Papers Michigan Acad. Sci. Arts, Lett., vol. 24, pt. II, 1938 (1939), pp. 29-31, pl. 2, fig. 2 (Bebedero, Costa Rica); Taylor, Univ. Kansas Sci. Bull., vol. 34, pt. 1, no. 1, Oct. 1, 1941, p. 142.

Coniophanes piceivittis piceivittis Mertens, Abh. senckenb. naturf. Gesel., no. 487, 1952, p. 61 (San Salvador).

In my paper on Costa Rican serpents I suggested that Bailey's record for this species in Costa Rica might be questioned. The finding of two specimens in western Costa Rica, four miles north of Hda. Santa Rosa (on Pan-American Highway), Guanacaste Province, in the summer of 1954, verifies its presence in the Country. These were taken by me in the vicinity of a small stream, in a pile of chips about the base of a recently felled tree. The arrangements of the markings on the body and head are as follows: first to third scale-rows with edge of the adjoining row, lavender cream, peppered lightly with lavender brown; anteriorly and posteriorly only two whole scale-rows are involved; above this on the fourth to eighth scale-rows a broad straight-edged black stripe which begins on the rostral and runs back, covering upper part of labials, and on neck, covers four whole scale-rows and the adjoining halves of two others; it gradually narrows to three rows and parts of the adjoining rows on the posterior parts of the body; a narrow, irregularly edged, cream line begins on rostral, passes above eye along edge of parietal to the neck where the edges become straight, and continues on to tail, covering the ninth whole row and parts of the adjoining scale-rows. The median black stripe covers the top of the head then continues to tail, covering five median scale-rows and the adjoining edges of two others, but reduces to three and two half rows on posterior part of body. The supralabials are cream, dark-edged above with a splashed black spot on the lower part of each scale. The infralabials, chinshields and scales at beginning of throat flecked with black. The ventrals are uniformly cream except for a few darker flecks on their upturned lateral edges. The second specimen agrees in rather accurate detail with the first.

Scale characters of these specimens, KUMNH No. 23553 and 23554 follows. Ventrals 165, 163; subcaudals 62 +, 83; scale rows 23, 25, 25, 19; 23, 25, 25, 19; supralabials, 8-8, 8-8; infralabials 10-10,

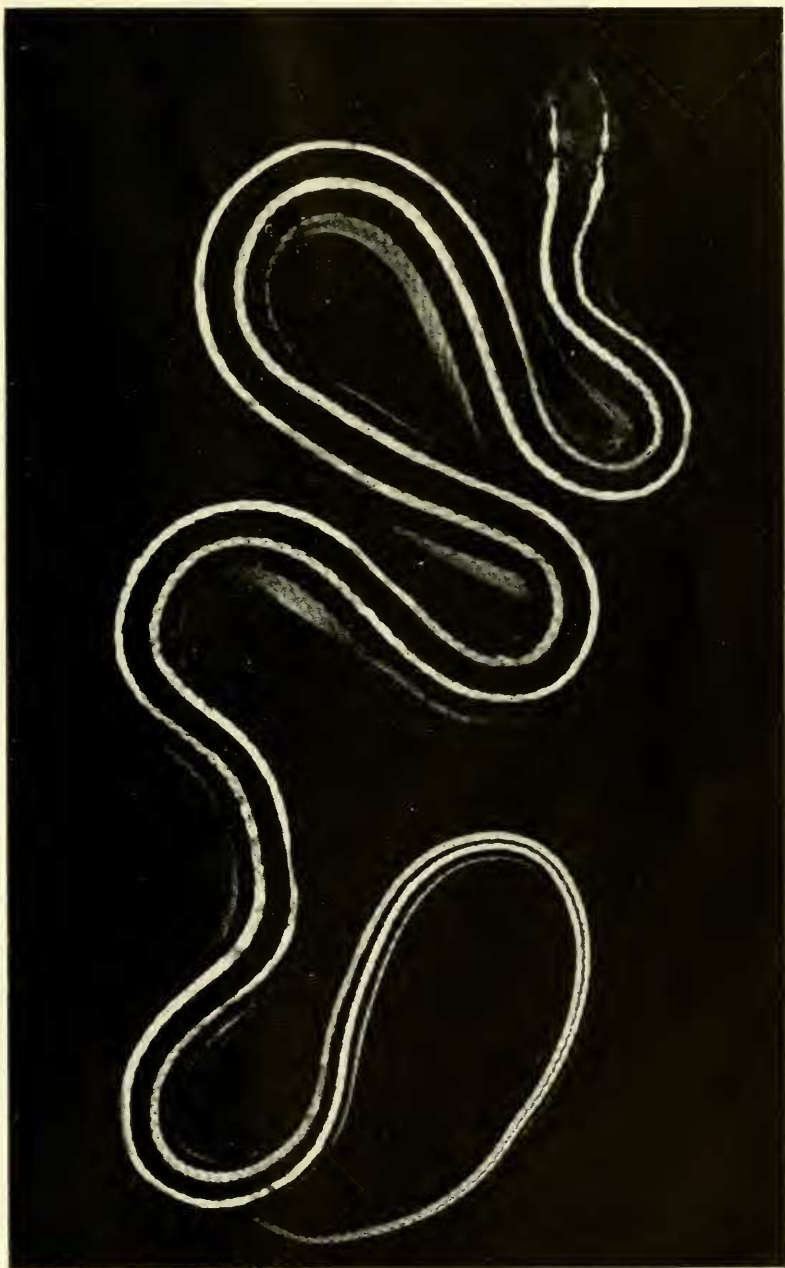


FIG. 17. *Coniophanes piceivittis piceivittis* Cope, KUMNH No. 23553, 4 mi. N Hda. Santa Rosa (on Pan-American Highway), Guanacaste, Costa Rica. About natural size.

10-10; preoculars 2-2; postoculars 2-2; temporals $1 + 2 + 4$, $1 + 2 + 3$; the scales on sides at least three inches in front and behind level of vent strongly keeled or tubercled; the anal scale is divided.

Neopareas bicolor Günther

(Figs. 18, 19)

Neopareas bicolor Günther, Biologia Centrali-Americana; Reptilia and Batrachia, July 1895, pp. 178-179, pl. 56, fig. C (type locality, Chontales Mines, Nicaragua); Taylor, Univ. Kansas Sci. Bull., vol. 34, 1951, p. 66 (incorrectly spelled *Neoparias*).

Leptognathus bicolor Boulenger, Catalogue of the Snakes in the British Museum, vol. 3, 1896, p. 460.

A specimen of this genus was obtained at Turrialba at the Inter-American Institute of Agriculture in 1952. The animal had gained admittance to the building of the Institute and was captured in one of the dormitories. The characters of this specimen are as follows:

Description of KUMNH No. 31920: Body strongly compressed; head short, the width of the neck (2.6 mm.) in width of head (7 mm.) 2.7 times; rostral wider than high, narrowly visible above as a broad triangle, the lower part of scale with an arched depression; internasals small, about one third area of the prefrontals, much wider than long, their common suture half that between the prefrontals; latter scales broader than long, touching nasal, loreal, and preocular laterally; both prefrontals and internasals with minute pustular rugosities; frontal pentagonal, shield-shaped, the anterior edge straight, transverse, its length (3.2 mm.) greater than its width (2.8 mm.); supraoculars narrowed anteriorly, widened posteriorly, not reaching back as far as frontal, but extending somewhat farther forward; parietals large, longer than frontal, their length equal to their distance from the internasals. Nasal single, irregular in shape, the back edge of the scale elevated and somewhat excavated behind nostril; loreal large, higher than long, bordering orbit below the smaller preocular; three postoculars, the lower smallest; temporals, $2 + 2 + 3$, $\frac{1}{2} + \frac{1+2}{1}$; supralabials 10-9, the fourth to seventh (third to sixth) entering orbit; mental small, much narrower than the rostral; infralabials, 11-12, first five touching the large azygos scale on chin, two (three) labials touching second azygos; third and fourth azygos each in contact with two labials; first pair of labials fused behind the mental; labials and azygos scales on chin with minute rugosities (male character). Eye very large, its diameter (2.5 mm.) greater than length of snout (2.1 mm. medial measurement).

Scales smooth, lacking pits; scale formula: 19 (back of head),

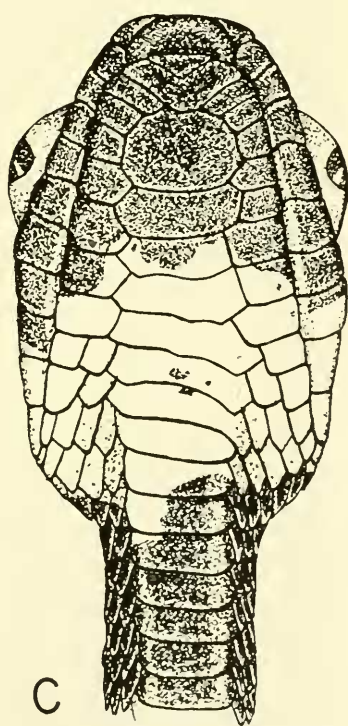
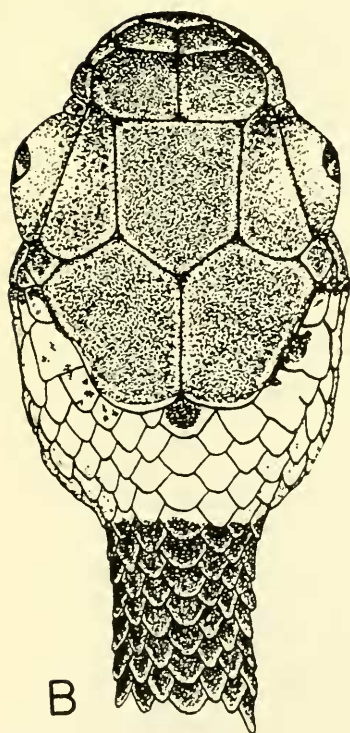
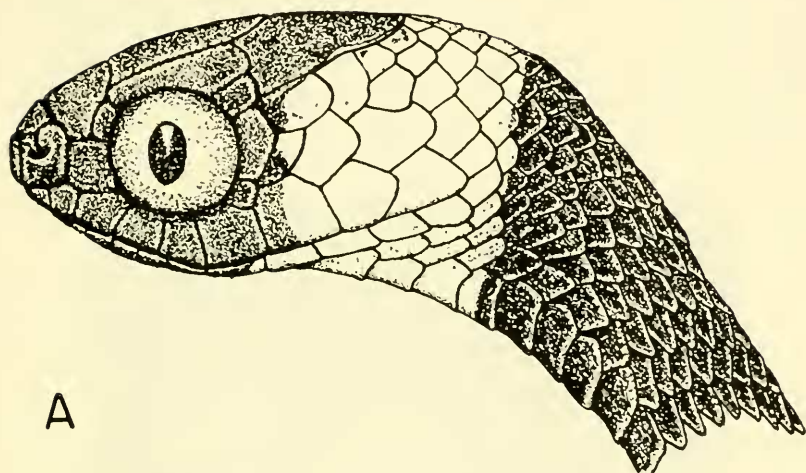


FIG. 18. *Neopareus bicolor* Günther. A. Head, lateral view. B. Head, dorsal view. C. Head, ventral view. All much enlarged.

15, 15, 15; the median dorsal row not or but scarcely larger than adjoining rows; two broadened, dorsal scales above anal region; scales behind the fourth azygos not differentiated from typical ventrals and the ventral count begins at that point: ventrals, 186; anal single; subcaudals, 118; total ventral-subcaudal count 304.

Color in preservative: Above black, banded with cream; the first

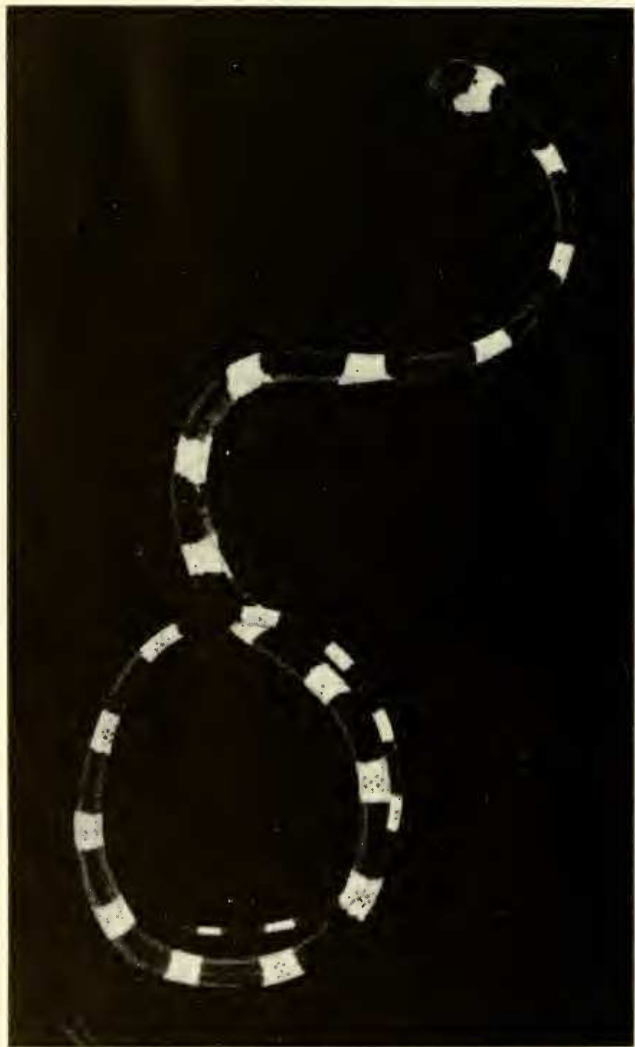


FIG. 19. *Neopareas bicolor* Günther. KUMNH No. 31920, Turrialba, Costa Rica; actual total length, 334 mm.

band on back of head about four scale-rows wide, dorsally widening laterally to include the temporals, posterior supra- and infralabials, the posterior azygos shield on chin and the following five ventrals; a discrete black spot on a somewhat enlarged median postparietal scale and a few very small dots of black on upper temporals; cream bands on head and body 16, dorsally covering approximately four transverse scale-rows, widening on the sides and covering five to six ventrals; the intervening black color covers ten scale-rows anteriorly then eight or nine in middle region and reducing to seven posteriorly on body; all becoming narrower on sides and venter; nine cream bands on tail, all, except first cream band, have series of black dorsal flecks.

Measurements in mm.: Total length, 334; snout to vent, 227; tail, 107; width of head, 7; length of head, 11.

Dentition: The dentition of this species is remarkable. The high anterior, dentary teeth, surrounded by gums, form two high longitudinal ridges in the anterior part of the floor of the mouth that fit into deep depressions in the anterior part of the palate; the lower jaws lie in the middle of the floor of the mouth separated by a distance of only 1.5 millimeters for much of their length. The sides of the mouth-floor are muscular. The maxillaries lie horizontal, the anterior teeth somewhat erect, the posterior curving, smaller than the teeth on dentaries. Maxillary teeth, 21, decreasing in size posteriorly; dentary teeth, 22, decreasing in size posteriorly; palatine and pterygoid teeth present.

Remarks: Günther, who described the genus and species had only a single specimen. The general characteristics of the teeth were not mentioned except to state that they were small and ungrooved. From data given by Günther and Boulenger the type specimen differs from my specimen as follows: twenty more scales in the total ventral-subcaudal count (324-304); two more encircling white rings (27-25); internasals larger, two thirds length of prefrontals (half length); frontal as long as broad (longer than broad); third azygos scale followed by a pair (fourth azygos scale undivided); cream bands immaculate (bands bearing numerous dorsal black flecks).

Since I did not see the specimen before preservation, it is possible that the light bands were originally pink or red. The collector "believed that such was the case, but was uncertain."

The amount of variation to be expected is unknown. A series may show constancy in the variations mentioned above.

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